Assessment

Forest Plan Revision

Final Permitted Livestock Grazing Report

Prepared by:
Kim Reid
Rangeland Management Specialist

for:
Custer Gallatin National Forest

February 16, 2017

Contents

Introduction

A draft of this report was released for public review on November 30, 2016 and feedback was requested by January 6, 2017. Changes made to the final report based on public feedback were to review and incorporate references, to make minor edits, and to add clarification relative to burned landscapes as it relates to primary, secondary, and transitory rangeland categories. Discussion was added recognizing larger cattle size, of the general impacts and benefits of livestock, and to show the relationship of grazing fees to counties from associated Federal payments. Statements were added to Table C-2, Appendix C that would allow a more refined summary by state if the reader chooses.

Permitted livestock grazing and rangeland management is a component of multiple use on National Forest System lands. Livestock grazing on these lands, if responsibly done, provides a valuable resource to the livestock owners as a multiple use of these lands. According to the Multiple Use Sustained-Yield Act of 1960, "It is the policy of the Congress that the National Forests are established and shall be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes."

It was never the intent of the Congress that all uses would occur on all areas. National forests determine what uses are feasible and appropriate for different areas through the development and revision of forest plans. When it has been determined that grazing is appropriate for an area grazing is managed with consideration of all the other uses of the area.

Rangelands are characterized by self-propagating plant communities, predominately grasses, grass-like forbs, shrubs and dispersed trees. They provide commodity, amenity and spiritual values vital to the well-being of people. In addition, rangelands provide a variety of ecosystem services, such as livestock forage, wildlife habitat, recreation, watershed functions, carbon sequestration, and biodiversity conservation. Sustainable management of rangelands requires not only that derived goods and services satisfy the desires of current generations, but that these resources are conserved to meet the needs of future generations. For the assessment of rangelands beyond those found in allotments, see the Terrestrial Ecosystems - Non-Forested Vegetation report (Reid, 2017).

At present, 199 permittees are grazing livestock on 216 active grazing allotments[1]. In addition, the Forest has 18 vacant allotments. The current permitted livestock grazing level on suitable primary rangeland is about 202,200 animal unit months per year. About an additional 8,000 associated animal unit months are grazed on intermingled private lands where management of the grazing resource is combined with the Custer Gallatin National Forest.[2] The Custer Gallatin National Forest is estimated to have about 658,000 acres of National Forest System primary rangeland suitable to livestock grazing or 22 percent of the Custer Gallatin National Forest.

Process, Methods and Existing Information Sources

Information sources include literature review of the best available science (see References in this report as well as References in the Terrestrial Ecosystems – Non-Forested Vegetation Report (Reid, 2017) and the Aquatics and Riparian Report (Barndt, Reid, and Chaffin, 2017), Forest Service internal reports, consultation with regional experts, summarization of riparian and green ash draw inventories,

[1] An allotment is a designated area of land available for livestock grazing upon which a specified number and kind of livestock may be grazed under an allotment management plan for a specified period of use. It is the basic land unit used to facilitate management of the rangeland resource on National Forest System lands. Allotments generally consist of National Forest-administered lands but may also include other federally managed, state-owned, and private lands. An allotment may include one or more separate pastures.

[2] These are called Term Private Land Permits where the owner waives grazing management to the Forest Service.

summarization of existing geospatial information systems (GIS) data, and analysis of statistically-based vegetation inventory data. In brief, the primary data sources used for this assessment include:

Natural Resource Management (NRM) iWeb Database – Range Module*:* Information for grazing permits, allotments, and related infrastructure is housed in the Natural Resource Management database. Summaries were queried for analysis statistics.

Allotment Capability Model: To assess the amount of primary, secondary, transitory, and non-capable rangelands within allotments, a capability GIS model was used. It was derived from forage capable areas on slopes less than 35 percent and within one mile of a water source. See Appendix A for more detail.

Region 1 Existing Vegetation database (VMap): Mapping of vegetation is based on the Region 1 existing vegetation database. It is a geospatial dataset developed using the Region 1 existing vegetation classification system (Barber et al. 2011). It is a remotely sensed product that is derived from satellite imagery, airborne acquired imagery, field sampling, and verification.

Riparian vegetation classifications in the original existing vegetation database do not include hydrological features; therefore, more refined riparian and wetland area data sources were incorporated using National Wetland Inventory data provided by the Montana State Natural Heritage Program which also covered the South Dakota portion of the Sioux District. National Wetland Inventory maps riparian and wetland areas based on aerial imagery, hydrological feature mapping, soils, and vegetation layers. The Montana State Natural Heritage Program layer represents a refined map of wetland resources down to tenth acre resolution based on aerial imagery and hydrological feature mapping. Nine quads in the Gallatin portion of the assessment area have not been completed yet, but are anticipated for completion in the near future.

For the montane units, National Wetland Inventory map data and a riparian extent model were included in the Region 1 existing vegetation database. Riparian extent was modelled by using a tool developed by Forest Service Washington Office personnel for the montane units. The model uses of a lakes/ponds feature class, digital elevation models, 6th hydrologic unit code watershed boundaries, and NetMap streams data whose parameters are applicable to hydrologic considerations of the montane units. Locations within the modeled riparian area that did not intersect with Montana State Natural Heritage Program or National Wetland Inventory polygons were attributed with Region 1 existing vegetation data via intersection. Where upland vegetation was mapped within riparian corridors, the location was classified as a riparian corridor. The basis for this classification is that, although dominated by non-riparian vegetation, these locations were within stream terraces (approximately the 50-year floodplain) and in proximity to the stream such that processes occurring within them influence the aquatic systems and vice versa. For example, many of these locations were high-gradient streams reaches with narrow floodplains, where conifers dominate the vegetated overstory, and whose recruitment to those stream reaches as large woody debris is critical for creation and maintenance of instream habitats (Rosgen 1996).

For the pine savanna units, National Wetland Inventory map data and refined Region 1 existing vegetation database green ash woodland data (Biswas, et. al., 2012) were used for inclusion into the Region 1 existing vegetation database. Flow regimes and stream orders were used to differentiate between non-riparian green ash woodlands and riparian-green ash woodlands. The riparian extent model used for the montane units was not used for the pine savanna units due to limited application of model parameters. However, National Wetland Inventory mapping is considered accurate for this land

area, in part because steep headwater streams with narrow floodplains influenced by large woody debris recruitment are very rare on this landscape.

Custer Gallatin National Forest Long-Term Monitoring data – Riparian: The Custer Gallatin "In Stream" database was developed to house riparian and channel morphology monitoring data. Monitoring follows protocols outlined in the Custer Gallatin National Forest riparian area monitoring framework. The protocol uses a modification of PacFish/InFish biological opinion sampling protocols to inventory and monitor riparian vegetation. This protocol and associated inventoried sites are not the same as the PacFish/InFish biological opinion protocols and their associated inventoried sites and the two datasets should not be mixed together.

The Custer Gallatin National Forest protocol is designed for integrated sampling of channel morphology and aquatic and riparian habitat along stream reaches susceptible to livestock grazing. It provides an inventory which includes interpreting Rosgen classification (Rosgen, 1996), proper functioning condition, and vegetation rapid assessment protocols, and an in-depth characterization of existing vegetative conditions for allotments programmed for outyear National Environmental Policy Act analysis. It is also used as a baseline for long-term monitoring, which includes the Custer Gallatin National Forest riparian vegetation sampling protocol and the channel morphology protocol. Data from this protocol are generally limited, at present, to grazing allotments on the Montane districts, where about 90 percent of the allotments have long-term monitoring sites (n=32) and where the bulk of the riparian resources occur. See Appendix B for more detail.

Proper Functioning Condition data - Riparian: Proper functioning condition is a methodology for assessing the functioning conditions of riparian areas (Dickard et al. 2015, Prichard, et. al, 2003; Prichard, et. al., 1998). Proper functioning condition defines a minimum level or starting point for assessing riparian areas. Proper functioning condition is most often collected within grazing allotments as a way of understanding how grazing may be influencing riparian conditions. See Appendix B for more detail.

Proper Functioning Condition data – Green Ash Woodlands (also known as woody draws): Proper functioning condition inventory data were summarized for existing condition of green ash woodlands using a modified protocol from Bureau of Land Management. Green ash condition data is most often collected within grazing allotments as a way of understanding how grazing may be influencing green ash woodland conditions. See Appendix C for more detail.

Scale

A variety of spatial extents are used depending on the analysis element:

Custer Gallatin National Forest (CGNF or assessment area): The assessment area covers approximately 3,039,000 acres, including private land inholdings.

Montane and Pine Savanna Units: These two units depict ecologically different areas. The montane unit includes the Hebgen Lake, Bozeman, Gardiner, Yellowstone, and Beartooth Ranger Districts and the pine savanna unit includes the Ashland and Sioux Ranger Districts.

Landscape Areas: The Custer Gallatin National Forest is broken into five landscape areas ranging from roughly 78,000 acres to 2.3 million acres, including private land inholdings. These include 1) Madison, Henry's, Gallatin, Absaroka and Beartooth Mountains, 2) Bangtail, Bridger, and Crazy Mountains, 3) Pryor Mountains, 4) Ashland District, and 5) Sioux District.

Some attributes are summarized at large scale of the Custer Gallatin National Forest extent to provide context and incorporate representative trends. Some of the analysis occurs at the landscape area scales. However, some components are described at a more localized scale where needed for smaller scale issues.

Within the Custer Gallatin National Forest, the local district ranger makes decisions for allotments and associated permitted grazing when they occur within their district's administrative boundaries. In the database used for this assessment, the associated information within the bounds of the district is labelled under the term "administrative organization." Because of logistical considerations and workload decisions, sometimes there are personnel that manage allotments and permits on their own district as well as on adjacent districts. In the database, the associated information is labelled under the term "managing organization" to reflect which district houses the personnel managing the allotment and permit. Most information in tables and charts are portrayed by "managing organization" rather than by "administrative organization" due to how the data is presented in the Natural Resource Management database. However, narratively both administrative organization and managing organization information are addressed. For the Custer Gallatin National Forest, most districts manage only allotments that occur on their district. The Yellowstone Ranger District manages all allotments that occur on the Yellowstone Ranger District and all allotments on the Gardiner Ranger District. The Bozeman Ranger District manages all allotments on the Bozeman Ranger District along with four of the eight allotments that occur on the Hebgen Lake Ranger District.

The temporal scale of analysis varies. Current condition analyses typically depict data generally collected within the last ten to fifteen years. Conditions are reviewed in light of past activities and processes that have occurred as long as 140 years ago - at the time of settlement in the area. Assessments of trend include predictions from now.

Current Forest Plan Direction

The Custer Forest Plan goal for rangelands is to achieve a diversity of beneficial uses of rangeland resources, including an integrated management approach designed to attain healthy and productive soil and vegetation and water. Where necessary livestock management efforts will be intensified to allow for the improvement of vegetative condition and improve wildlife habitat. Land capabilities coupled with intensive management will dictate, on an allotment by allotment basis, the appropriate stocking level and the season of use. Further Forest Plan direction includes:

- Structural range improvements will be located to minimize livestock impacts on woody draws and riparian zones.
- In areas known to be important for the perpetuation of selected wildlife species (elk, bighorn sheep, raptors, grouse, and grizzly bear – Custer Forest Plan Management Area C, livestock grazing use will be modified as needed to meet wildlife habitat needs.
- Livestock grazing will not be allowed in developed sites, unless it can be accommodated before or after the recreation use season and is instrumental in the management of the site.
- Forage production realized through timber management activities will be treated as transitory range and livestock use will not be encouraged if regeneration problems occur.
- Livestock grazing will continue but managed to protect the unique value of National Natural Landmarks.
- Livestock grazing may be used to achieve other resource objectives in administrative sites.

- No grazing of livestock will be permitted in the Pryor Mountain wild horse territory.
- Only recreational livestock will be allowed in the West Fork of Rock Creek municipal watershed.

The Gallatin Forest Plan goal for rangelands are to provide improved forage management to maintain or enhance the rangeland environment. Further Forest Plan direction includes:

- Vacant livestock allotments are to be evaluated and allotment plans prepared prior to livestock use.
- Sheep are not be permitted into vacant allotments in grizzly bear management situation 1 areas.
- Livestock grazing in riparian areas are to be controlled at levels of utilization listed for the riparian management area (7).
- Allotments with continuous grazing during the growing period are to be evaluated and alternative grazing systems applied.
- There are to be no new sheep allotments permitted within big game winter range (Management Area 14); on existing livestock allotments in big game winter range (Management Area 14) big game forage needs are to be met before making allocations to livestock.
- Damage control methods such as livestock fencing or alternative grazing systems will be used to ensure protection of regenerated tree stands.
- No livestock grazing will occur within undeveloped lands in the Taylor Fork drainage characterized by highly sensitive soils (Management Area 3).
- Livestock grazing is prohibited in the northern portion of the Hyalite-Porcupine-Buffalo Horn study area (Management Area 18) and in a portion of the Hyalite-Porcupine-Buffalo Horn Montana Wilderness study area (Management Area 19).

The current livestock grazing standard in the Custer National Forest Plan is follow the direction for grazing use within occupied grizzly bear habitat. The "Guidelines for Grizzly Bear Management in Greater Yellowstone Area" and Custer National Forest grizzly bear guidelines will be the basis for resolutions of any conflicts between livestock and grizzly bears.

The current livestock grazing standard in the Gallatin National Forest Plan is that grazing use will be guided by the Greater Yellowstone Area grizzly bear conservation strategy where inside the primary conservation area or recovery zone for grizzly bears: 1) the number or acreage of active livestock grazing allotments above that which existed in 1998 is not to be increased, 2) vacant or closed sheep allotments are not to be re-activated, or 3) existing active or vacant cattle or horse allotments are not to be converted to sheep allotments.[3]

[3] Application Rules for Livestock Grazing
• If the number of active allotments is at the 1998 baseline, and a vacant or closed allotment inside the Primary Conservation Area or Recovery Zone (PCA/RZ) is reactivated, a currently active allotment of equal or greater acreage must become vacant or closed within the PCA/RZ.
• Where chronic conflicts with grizzly bears occur on livestock allotments inside the PCA/RZ, and if the permittee is willing, non-use for resource protection can be authorized. Another option with a willing permittee is to temporarily or permanently move livestock to a vacant allotment either inside or outside the PCA/RZ where the potential for conflict is reduced.
• Within capacity, and with the appropriate analysis, increases or reductions in the number of permitted cattle and/or horses can be allowed on active allotments.

Common to both the Gallatin National Forest and Custer National Forest is the direction that livestock use is not allowed unless permitted prior to research natural area establishment. Common to both the Gallatin National Forest and Custer National Forest is the direction for existing grazing allotments within wilderness areas. Livestock grazing is to be managed in accordance with wilderness values[4];

Common to both the Gallatin National Forest and Custer National Forest is the direction for riparian areas where they are to be identified and mitigation to be implemented to retain unique riparian values during project level allotment management planning for permitted livestock grazing. Adequate vegetation at the end of the growing season is important to provide streambank stability, protect streambanks from runoff events, and trap and filter potential sediment deposits. Desired vegetation that can meet these criteria are deep rooted water loving species.

Utilization standards for riparian areas are provided in the Gallatin Forest Plan while utilization guidelines are provided in project-level decisions on the Custer National Forest. Regardless of where allowable utilization levels are found, in general, use is not to exceed 45 to 60 percent forage utilization by weight and not to exceed 35 to 50 percent browse utilization, depending on conditions and combined management prescriptions. Management grazing prescriptions (including allowable use levels, duration, timing, and rotations) are tailored for specific conditions found on individual allotments. Regional utilization guidelines were removed from policy several years ago since management prescriptions need to be done on a case by case basis at the allotment management scale. The allowable use standards for riparian areas currently found in the 1986 Gallatin Forest Plan were designed after these now obsolete regional guidelines. The Custer Gallatin National Forest riparian area framework, developed by an interdisciplinary working group, provide similar allowable use guidelines with concepts of further restrictions in use levels depending upon severity of departure from desired conditions. These guidelines also recognize that there is a need for individual allotment management prescriptions where additional combined management prescriptions (for example, shortened duration, timing, improved distribution, etc.) might mitigate strict adherence to the framework's allowable use guidelines alone.

As outlined in the Custer Forest Plan, green ash woodlands, also known as woody draws, are to be identified and mitigation to be implement to retain unique values during project level allotment management planning for permitted livestock grazing.

As outlined in the Custer Forest Plan riparian and woody draw management areas, Management practices such as fencing, grazing deferment, burning or planting may be tried on selected areas to determine their effectiveness in maintaining or improving green ash woodland or riparian conditions. Large scale fencing efforts to protect these areas are generally not practical. Structural range improvements will be located to attract livestock out of this management area. Nonstructural range improvements will be done only to improve diversity of habitats or implement practices designed to restore the desired vegetative composition.

See the Terrestrial Ecosystems – Non-Forested Vegetation Report (Reid, 2017) and the Aquatics and Riparian Report (Barndt, Reid, and Chaffin, 2017) for further Forest Plan direction in these important rangeland components.

• Combining or dividing allotments is allowed as long as the net acreage and number of active allotments does not exceed the 1998 baseline.

[4] Applicable grazing direction is found in HR Report No. 96-1126, dated June 24, 1981 (GNF FP Appendix F-1).

Existing Condition

Area Affected by Permitted Livestock Grazing

Approximately one third (36 percent) of the Custer Gallatin National Forest consists of livestock grazing allotments (22 percent of the montane units and 93 percent of the pine savanna units). However, approximately a fifth or 22 percent of the Custer Gallatin National Forest consists of primary rangeland where livestock generally graze (6 percent of the montane units and 86 percent of the pine savanna units).

Table 1 displays allotment acreage, the acreage affected by livestock grazing in primary rangelands, and the percent of primary rangelands found with allotments and Custer Gallatin National Forest.

Table 1. Portion of the Custer Gallatin National Forest with livestock grazing allotments and primary rangelands (National Forest System acres)

Ranger District	District Acreage	Allotment Acreage[5]	% of CGNF, Comprised of Allotment Areas		Primary Rangeland Acreage	% of CGNF Comprised of Primary Rangeland
Montane Units						
Hebgen Lake	336820	22092			5700	
Bozeman	422433	110836			25683	
Gardiner	388066	39790			7704	
Yellowstone	702503	233427			58840	
Beartooth	588913	117580			42964	
Montane Subtotal	2438735	523725	22%		140891	6%
Pine Savanna Units						
Sioux	164469	162124			148396	
Ashland	436148	431607			376945	
Pine Savanna Subtotal	600617	593731	93%		525342	87%
CGNF Grand Total	3039352	1117456	36%		666233	22%

Capability and Suitability

Capable rangelands produce forage or have inherent forage producing capabilities, and if accessible can be grazed on a sustained yield basis. Primary rangelands are those areas that produce forage and that are near water where primary grazing activity occurs. On Custer Gallatin National Forest rangelands, livestock tend to congregate on the more convenient gentle terrain such as valley bottoms, riparian, hardwood draws, and ridgetops. Secondary rangelands are those areas that produce forage but are too far away from water or access is impeded due to natural barriers. Transitory rangelands are areas near water and accessible to livestock where forage is temporarily created by events such as wildfire or activities such as timber harvest that temporarily open previously closed-canopied forest conditions. See Appendix A of this report for further details regarding primary, secondary, and transitory rangelands.

[5] Allotment acreage is for administrative organization of the Ranger Districts proper, not the managing organization of which Ranger District manages the allotments regardless of what District it resides in.

In addition, in previously burned areas or timber harvest, primary rangelands have increased in forage production in areas previously consisting of open-canopied forest cover. This has provided opportunities for improved livestock distribution until such time that forested canopy cover increases over time. As an example, recent fires across the Ashland landscape burned about 76,439 acres of forested cover types (see Reid, 2017, Non-Forested Vegetation Report; Appendix A, Table A-1, Transitional Forest category), of which 3,472 acres were closed canopied forests pre-fire (Appendix A of this report, Table A-1, Transitory Range category). The remaining 72,967 acres that were open canopied forests, pre-fire, are still considered primary and secondary rangeland, but with increased forage production. About 658,000 acres (National Forest System lands within allotments) or 22 percent of the Custer Gallatin National Forest lands are considered primary rangeland (6 percent of the montane units and 86 percent of the pine savanna units are primary rangeland). About 38,100 acres or about 1 percent of the Custer Gallatin National Forest assessment area are considered secondary rangeland. About 3 percent of the assessment area is primary rangeland found within 1/8 mile of water where more concentrated use by livestock is likely to occur. Appendix A provides more detail about capable and non-capable lands within allotments deemed suitable for grazing.

Suitable areas are capable areas minus areas chosen to be unacceptable to graze to minimize conflicts with areas such as campgrounds, other developed recreation sites, research natural areas, fenced rights-of-way or other areas closed by decision. These suitable areas must also be accessible to a specific kind of animal and which can be grazed on a sustained yield basis. The existing forest plans are supported by a grazing suitability analysis that was done in the mid-1980s. In addition, there have been various suitability analyses conducted on allotments that have been closed since then. Allotment specific capability and suitability analyses have been conducted on allotments with changed conditions resulting in decisions that have refined capability and suitability aspects relative to livestock use. Current allotments are deemed suitable for permitted grazing and suitability is verified during allotment level National Environmental Policy Act analyses.

Allotments

Substantial numbers of cattle and sheep have grazed in the assessment area since around the turn of the 20st century, beginning in the 1880s. The use of forage by livestock was unorganized at this time and caused considerable soil erosion and a reduction in plant diversity. By 1890, after a couple of consecutive harsh winters, the cattle market was depressed, keeping cattle numbers relatively low. In contrast, sheep were increasing in the same area. The areas were grazed as a large public commons until the national forests were formed just after the turn of the 20th century. Many sheep grazed on the Forest year round (at low elevations in the winter). After World War I, market conditions caused a decline in cattle and sheep (between 1924 and 1925). With the droughts of the 1930s, conditions deteriorated. New Deal monies during the depression enabled the construction of stock driveways to access allotments and drift fences needed to curtail livestock trespass. In sharp contrast to World War I, when World War II started the grazing season was shortened. New range management practices were adopted after World War II, and the amount of livestock use approved for grazing was reduced (Meyer et. al., 2007). With the formation of the Forests, allotments were formed and water developed. Rotational grazing systems were developed in the mid-1900s. The amount of livestock use approved for grazing continued with some reductions where monitoring indicated the need.

Compared to the amount of livestock use on the Custer Gallatin National Forest at the beginning of the 20th century, today's levels of are low. As an example, at the turn of the century there were as many as 10 to 12 bands of sheep using National Forest System lands of the Pryor Mountains as summer range as well as some of the resident cattle. Some winter use of the southern slopes was also made by sheep.

When Pryor Mountain became part of the National Forest System in 1906, some order began to be established. By 1920, close to 40,000 animal unit months of forage were being used on National Forest System lands in the Pryor Mountains. By 1996, 7,121 animal unit months were permitted or about one fifth (18 percent) of the use that was occurring in the early 1900's. In 2016, 5,572 animal unit months are permitted or about one seventh (14 percent) of the use that was occurring in the early 1900s (Reid, 2017).

This trend has continued and there are currently 216 active allotments on the Custer Gallatin National Forest. Figure 1 and Figure 2 display the general location of where livestock are currently permitted to graze.

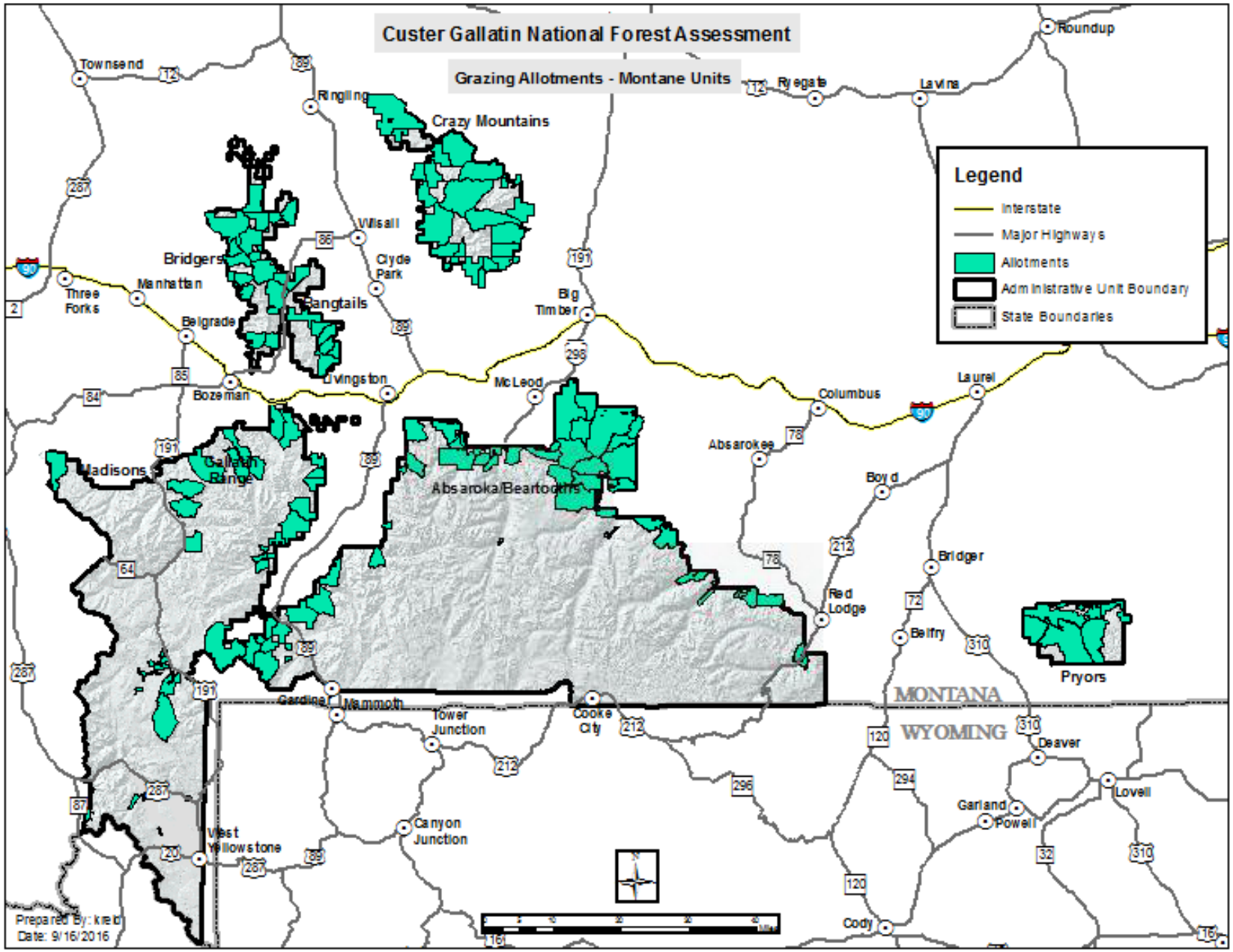

Figure 1. Map of Custer Gallatin National Forest grazing allotments – montane units

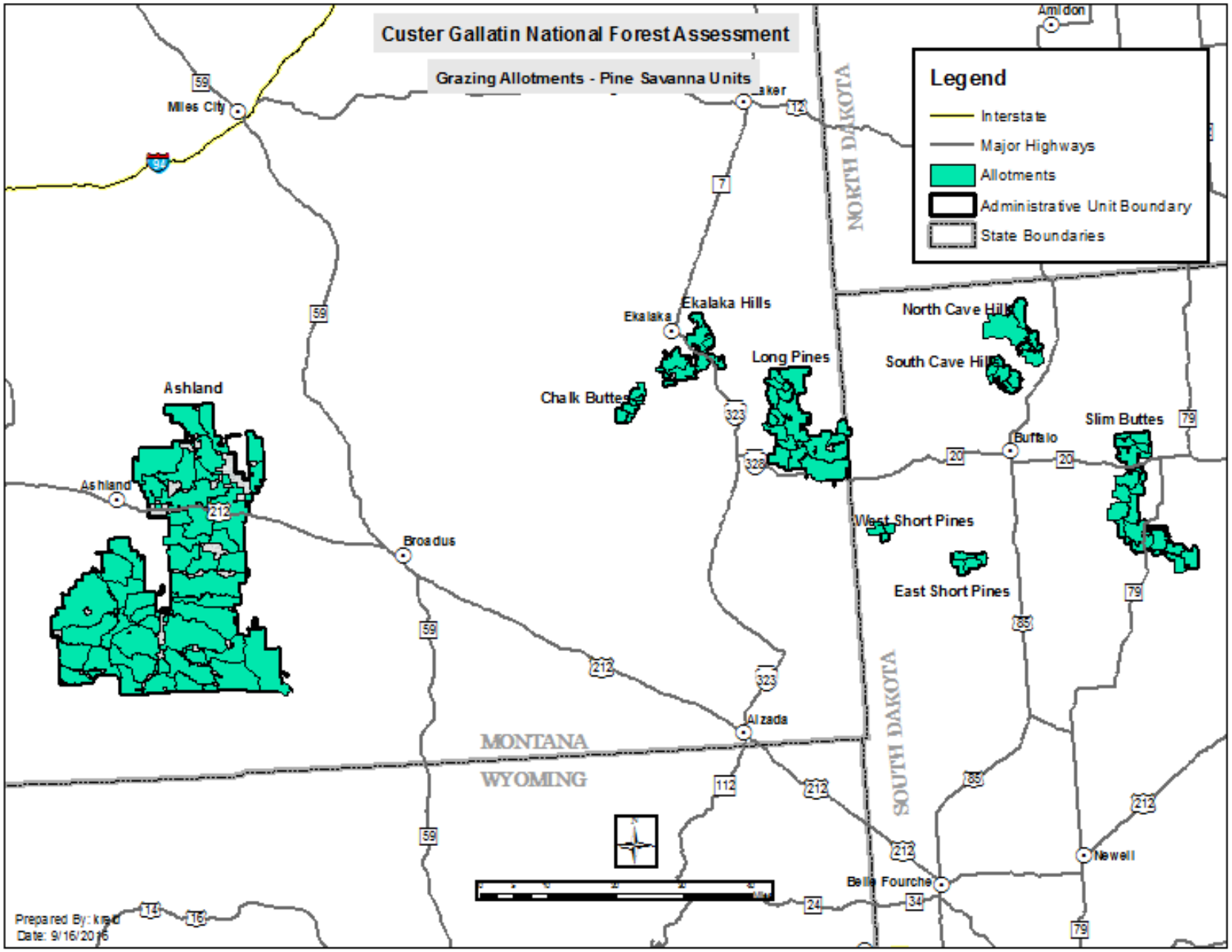

Figure 2. Map of Custer Gallatin National Forest grazing allotments – pine savanna units

At present, 199 permittees are grazing livestock on 216 active grazing allotments. In addition, the Custer Gallatin National Forest has 18 vacant allotments. For a variety of reasons, 59 allotments (primarily cattle) have been formally closed on the Gallatin portion of the Custer Gallatin National Forest since the 1986 Forest Plans. Nine of the 59 closures were done through decisions made in the 1986 Forest Plan while the remaining 50 have been closed since then. Closures were typically done after years of allotments being vacant and were based on allotment viability, logistics and economics of operations, limited access, ownership changes from land exchanges, failing infrastructure, grizzly bear conservation, and other wildlife considerations (See Appendix E for closure locations and further detail).

Table 2 outlines the number of active, vacant, and closed allotments by managing district.

Table 2. Grazing allotments[6] within the assessment area by managing district

Managing Organization	# Active Allotments	# Vacant Allotments[7]	# Closed Allotments since 1986
Montane			
Hebgen Lake Ranger District	4	1	15
Bozeman Ranger District	30[8]	1	16
Yellowstone Ranger District	53[9]	15[10]	28
Beartooth Ranger District	23	1	
Montane Subtotal	110	18	59
Pine Savanna			
Ashland Ranger District	44		
Sioux Ranger District	62		
Pine Savanna Subtotal	106	0	0
Grand Total	216	18	59

Allotment management plans contain the pertinent livestock management direction from the project-level NEPA-based decisions and include a general monitoring plan. National Environmental Policy Act decisions and allotment management plans are considered to be part of the permit's terms and conditions.

Annual operating instructions document actions that are needed for implementation of the management direction set forth in the project-level National Environmental Policy Act -based decision. The annual operating instructions identify the obligations of the permittee and the Forest Service and articulates annual grazing management requirements, standards, and monitoring necessary to document compliance. Annual operating instructions are typically issued to allotment permittees during annual meetings prior to the grazing season.

[6] Source: NRM Range Module User View Table - GIS Core Data View Allotments V for active and vacant allotments and a mix of district records and NRM data, resulting in Appendix E summary, for closed allotments.

[7] Vacant allotments are livestock grazing allotments without an active permit, but could be restocked or used periodically by other permittees at the discretion of the agency to resolve resource issues or other concerns.

[8] 26 occur within the Bozeman RD and 4 occur within the Hebgen Lake RD administrative boundaries.

[9] 48 occur within the Yellowstone RD and 5 occur within the Gardiner RD administrative boundaries.

[10] 11 occur within the Yellowstone RD and 4 occur within the Gardiner RD administrative boundaries.

Policy requires the Forest Service to monitor the grazing use of allotments. In addition, specific monitoring requirements are generally included in the project-level National Environmental Policy Act decision that authorizes livestock grazing. All of the project-level National Environmental Policy Act decisions on the Custer Gallatin National Forest have varying levels of monitoring requirements based on case-by-case issue driven needs.

About 35 to 50 percent of the allotments are inspected annually. Compliance problems with the terms and conditions of grazing permits vary across the units and follow-up actions are initiated. Compliance with permit terms and conditions relates to whether or not a permit holder ensures that annual instructions or allotment management plans are being followed, including timing, intensity, and location of stock. It also includes such items as maintenance of range improvements per permit terms and conditions. Generally, range inspections with permittees are done on those allotments where compliance issues have developed in order to try and jointly resolve the issues where possible.

Some level of allotment management planning has been completed on nearly all of the 234 active and vacant allotments on the Custer Gallatin National Forest. About 91 percent or 212 allotments (active and vacant) have had National Environmental Policy Act review. Currently, the 22 allotments (15 active and 7 vacant) that have not had National Environmental Policy Act analysis conducted have been scheduled for revision over the next ten years. Other allotments may also have priority needs for assessment as well.

Table 3. Active and vacant allotment National Environmental Policy Act analysis completion level by managing district

Managing Organization	# Allotments[11]	# Allotments with NEPA Decisions	# Remaining Allotments - Priority for NEPA	% Completed	Remaining Active and Vacant Allotments - Priority for NEPA
Montane					
Hebgen Lake	5	5	0	100%	
Bozeman	31	31	0	100%	
Yellowstone	68	52	16	76%	Livingston and Gardiner areas: Duck Cr, Pine Cr, Elbow, 6 Mile North. *3 of the 7 Remaining Resc. Allot. in Vacant Status - 6 Mile South, Suce Cr./ Deep Cr South Big Timber area: Basin (Potential Land Exch)/ Dry Fk, Kid Royal, Swamp Cr, Sweetgrass. *4 of the 9 Remaining Resc. Allot. in Vacant Status - Lost Cabin Cr, Grouse Cr, Evergreen, Contact
Beartooth	24	21	3	98%	E & W Fishtail, Little Rocky
Montane Subtotal	128	109	19	85%	
Pine Savanna					
Sioux	62	62	0	100%	
Ashland	44	41	3	95%	Liscom Butte, Gold, Cow Cr

[11] Active and Vacant Allotments

Managing Organization	# Allotments[11]	# Allotments with NEPA Decisions	# Remaining Allotments - Priority for NEPA	% Completed	Remaining Active and Vacant Allotments - Priority for NEPA
Pine Savanna Subtotal	106	103	3	97%	
Grand Total	234	212	22	91%	

Allotments in Designated or Other Special Areas

Appendix D provides detailed information relative to primary rangelands occurring within designated or special areas.

Wilderness Areas. Section (4) (d) (4) (2) of the Wilderness Act provides for continued livestock grazing where established prior to the designation of wilderness. There are nine allotments that lie, wholly or partially, within wilderness areas. One active allotment is within the Lee Metcalf Wilderness and eight (2 active and 6 vacant) allotments are within the Absaroka Beartooth Wilderness. Approximately 1,310 primary rangeland acres occur within the Lee Metcalf Wilderness and about 2,650 primary rangeland acres occur within the Absaroka Beartooth Wilderness. See Appendix D for further detail.

Research Natural Areas / Special Interest Areas. Of the ten designated research natural areas and two special interest areas, two research natural areas and one special interest area contain portions of allotments. Poker Jim Research Natural Area falls within the West O'Dell allotment on the Ashland District and is not fenced away from allotment cattle. Even though model results show about 75 percent of research natural area is found within secondary rangeland and 25 percent are lands not capable for grazing, the area receives grazing use due to some perennial water not captured in the model (Pers. Comm., S. Studiner). A portion of Sliding Mountain Research Natural Area falls within the Sixmile South allotment on the Yellowstone District. About 9 percent of RNA is found within secondary rangeland and 91 percent are lands not capable for grazing.

Portions of Bangtail, Jackson Creek, North Canyon, South Canyon, and Willow Creek allotments are located within the Bangtail Special Interest Area. Primary rangelands make up approximately 40 percent of the special interest area with about 60 percent being lands not capable for grazing. For more detail of this special interest area, see the Research Natural Areas/Special Interest Areas report (Reid, 2017).

Pryor Mountain Wild Horse Territory. There are no permitted livestock or allotments within the Pryor Mountain wild horse territory.

Grizzly Bear Recovery Zone. The grizzly bear habitat standard outlined in the Forest Plan, as amended, and the conservation strategy relative to livestock outlines that the number and acreage of livestock allotments, and number of permitted sheep animal months will not exceed 1998 levels inside the recovery zone. Existing sheep allotments will be phased out as the opportunity arises with willing permittees. Since the 1998 timeframe, sheep allotments on the Custer Gallatin National Forest have been phased out; no new allotments have been established, and several other allotments have been closed. These actions are consistent with current Forest Plan standards and grizzly bear conservation strategy standards for the recovery zone outlined in Appendix D. Of the 272,767 allotment acres within 1998 recovery zone baseline, 73 percent have been closed, 6 percent are vacant, and 21 percent remain in active allotments. See Appendix D for further detail.

Bison Tolerance Zones. On the Hebgen Lake Ranger District, there are two active horse allotments within western bison zone 2, four active horse allotments within the western year-round bison tolerance zone, and two active cow/calf pair allotments and one vacant cow/calf pair allotment outside of but near the western bison management zones to the south and west. On the Gardiner Ranger District, there are two active (6/16 grazing season entry dates) and three vacant cow/calf pair allotments within the northern bison tolerance zone and three active cow/calf pair allotments in Tom Miner Basin outside of but near the northern bison management zones. See Appendix D for further detail.

Greater Sage-Grouse Habitat. About 100 percent of core and about 88 percent of general greater sage-grouse habitat within the assessment area are in grazing allotments. Within allotments, approximately 2,200 acres are core (priority) habitat while about 123,400 acres are general habitat. See Appendix D for further detail.

Allotment Infrastructure

Allotment management integrity relies heavily upon the maintenance of the related infrastructure such as fences, reservoirs, pipelines, and water troughs that have been established throughout the Forest. Allotment infrastructure is most prevalent on the Sioux and Ashland Districts. There are approximately 2,800 miles of fence and about 1,850 water developments related to the management of allotments.

Table 4. Miles of fence and number of water developments on active allotments by ownership and managing district

Managing Organization	Miles of Fence			# of Water Developments		
	NFS	Other	Grand Total	NFS	Other	Grand Total
Montane						
Hebgen Lake Ranger District	24	14	38			
Bozeman Ranger District	154	47	201	73	9	82
Yellowstone Ranger District	74	75	149	115	9	124
Beartooth Ranger District	144	103	247	60	2	622
Montane Subtotal	396	239	635	248	20	828
Pine Savanna						
Ashland Ranger District	843	679	1522	1218	14	1232
Sioux Ranger District	362	256	618	349		349
Pine Savanna Subtotal	1205	935	2140	1567	14	1581
Grand Total	1601	1174	2775	1815	34	1849

Table 5. Type and number of water developments on active allotments by managing district

Managing Organization	Dugout	Guzzler	Pond	Reservoir	Storage Tank	Trough	Grand Total
Montane							
Hebgen Lake							
Bozeman						83	83
Yellowstone			3			121	123
Beartooth	5			2	6	49	62
Montane Subtotal	5		3	2	6	253	268
Pine Savanna							

Managing Organization	Dugout	Guzzler	Pond	Reservoir	Storage Tank	Trough	Grand Total
Ashland	21	2		182	65	962	1232
Sioux	3			13	7	326	349
Pine Savanna Subtotal	24	24	48	195	72	1288	1581
Grand Total	29	2	3	197	78	1541	1850

Large wildfires are anticipated in the future which can substantially increase costs to the permittees and Forest Service associated with maintenance and repair of allotment infrastructure such as fence. These events will have an economic effect on permittees, the Forest Service, and adjacent private land owners relative to infrastructure repair. Large wildfires[12] in the recent past have damaged a significant amount of allotment fence and water infrastructure by varying degrees. Various funds were acquired and agreements with adjacent land owners and permit holders were often developed to deal with the magnitude of such massive repair needs. Short-term economic impacts to permittees may also occur after wildfires when they have to seek forage elsewhere until post-fire recovery and infrastructure repair occurs.

As an example, between 2000 and 2012 nearly 800 miles of fence were damaged by wildfires on the Custer portion of the Custer Gallatin National Forest where over two million dollars were used primarily for material replacement. Cost associated with labor was done primarily through contract, permittee, and adjacent landowner work. Based on readily available data, Table 6 displays the approximate cost for repair between 2000 and 2012 on primarily the Custer portion of the Custer Gallatin National Forest.

Table 6. Amount of infrastructure wildfire damage and repair expense – 2000 to 2012

Year	Fire	All Owner-ships Fire Size (Ac)[13]	NFS Fire Size (Ac)[14]	Private Boundary Fence (Miles)	Interior Fence (Miles)	Total Fence (Miles)	Funds Acquired (Thousands)
2000	Ashland - Ft Howe Complex and Tobin Complex	73,000	68,900[15]	40	100	140	$467
2002	Sioux - Kraft Springs	65,600	40,700	96	57	153	$422
2002	Beartooth - Red Waffle	5,900	5,100	0	3	3	$5
2006	Ashland - Watt Draw	18,200	15,900	10	19	29	$7
2006	Beartooth/Yellowstone - Derby	208,200	71,100[16]	43[17]	49[18]	92	$211
2007	Ashland Lost/Wilber	12,100	12,100	0	12	12	$15

[12] Smaller fires or fires where fences were not damaged are not summarized. These include Beartooth 2000 Willie, Ashland 2003 Wiley, Beartooth 2007 Initial Cr, Beartooth 2008 Cascade, Beartooth 2011 Hole-In-The-Wall, Ashland 2012 Stag, Beartooth 2013 Rock Cr. and Beartooth 2015 West Fork.
[13] Acreages are rounded
[14] Acreages are rounded
[15] Ft. Howe Complex 55,900 NFS Acres and Tobin Complex 8,200 NFS Acres
[16] 15,500 CNF and 55,600 GNF for the Total CNF/GNF 71,100 NFS acres
[17] Of the total NFS miles, 8 miles CNF
[18] Of the total NFS miles, 15 miles CNF

Year	Fire	All Owner-ships Fire Size (Ac)[13]	NFS Fire Size (Ac)[14]	Private Boundary Fence (Miles)	Interior Fence (Miles)	Total Fence (Miles)	Funds Acquired (Thousands)
2011	Ashland Diamond Complex (Mill, Maverick, and Little Fk)	53,000	13,600	14	9	23	$56
2012	Ashland SE MT Complex (Ash Cr / Taylor Cr) Ashland – Dutch Sioux - Dugan	312,400 19,234 10,466	143,200 9899 6564	189 7 20	115 3 7	304 10 27	$825
	Totals	778,100	185,363	419	374	7933	$2042

Permitted Grazing

Permitted livestock grazing has been and continues to be a use of National Forest System lands. Although rangeland provides a variety of ecosystem services, such as wildlife habitat, recreation (including that associated with wildlife), watershed functions, carbon sequestration, and biodiversity conservation, these lands have primarily been managed for forage. The Custer Gallatin National Forest currently has 199 permittees that are authorized to graze livestock. Table 7 and Figure 3 display the number of grazing permit holders by the managing unit.

Table 7. Current number of Custer Gallatin National Forest grazing permit holders by managing district

Managing Organization	Number of CGNF Grazing Permit Holders
Montane	
Hebgen Lake Ranger District	2
Bozeman Ranger District	21[19]
Yellowstone Ranger District	41[20]
Beartooth Ranger District	22
Montane Subtotal	22
Pine Savanna	
Ashland Ranger District	60
Sioux Ranger District	53
Pine Savanna Subtotal	113
Grand Total	199

[19] 17 occur within the Bozeman RD and 4 occur within the Hebgen Lake RD administrative boundaries.

[20] 38 occur within the Yellowstone RD and 3 occur within the Gardiner RD administrative boundaries.

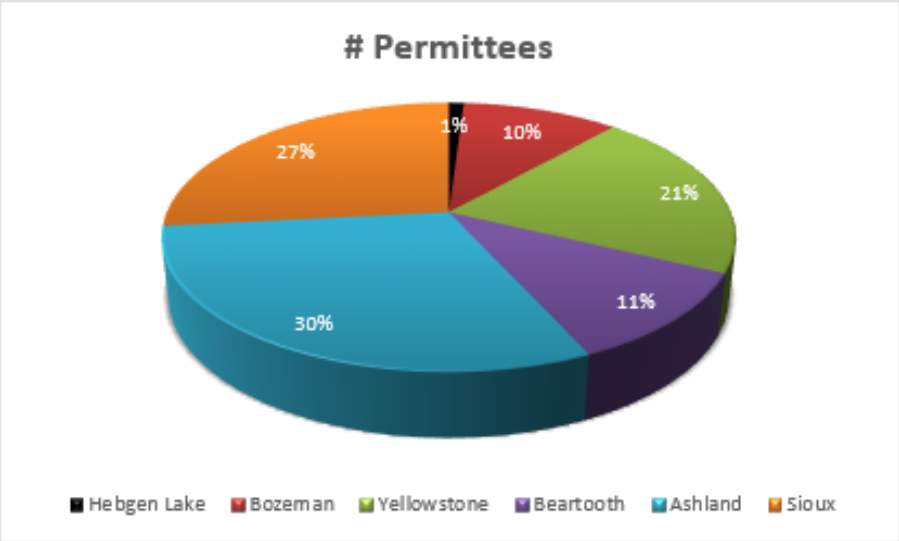

Figure 3. Number of Custer Gallatin National Forest grazing permit holders

There are approximately 36,200 head of cattle, 550 horses and 400 domestic bison permitted to graze at various times throughout the year on National Forest System lands and associated private lands. In general, for the pine savanna units the primary grazing season is between May 20 and November 15 and from June 15 to October 15 for the montane units, although some are longer or shorter. About 57 percent of the permittees are permitted to graze lands within the pine savanna units and 43 percent in the montane Units.

Table 8. Number of livestock permitted by managing district[21]

Managing Organization	Domestic Bison	Horses	Mature Cows	Mature Cows with Calves[22]	Yearling Cattle (9-18 Months)	Grand Total
Montane Units						
Hebgen Lake Ranger District		4		70		74
Bozeman Ranger District		507	300	2168	15	2990
Yellowstone Ranger District		24		3023		3047
Beartooth Ranger District		1	36	2896	1921	4854
Montane Subtotal		536	336	8157	1936	10965
Pine Savanna Units						
Ashland Ranger District		7	1	14382	3920	18310
Sioux Ranger District	400	5	964	5930	633	7932
Pine Savanna Subtotal	400	12	965	20312	4553	26242
Grand Total	400	548	1301	28469	6489	37207

[21] Source: Range module in NRM Infra database, user view table II_RGE_PMT_USE_V_04_01_2016 for CGNF, where permits are active; permit lines are active, modified, or pending; and where livestock count is yes.
[22] Includes associated bulls

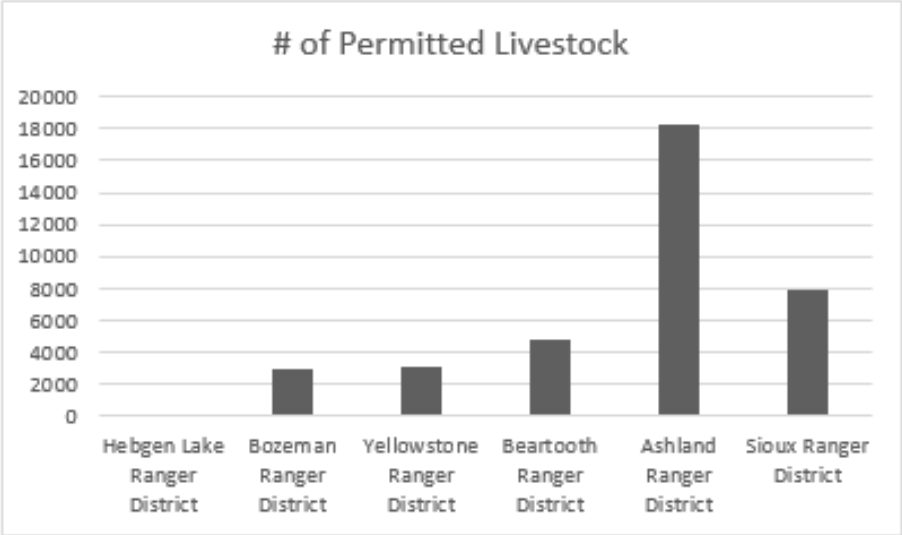

Figure 4. Total number of permitted livestock by ranger district

Permitted Use. Forage is often measured in terms of animal unit months (AUMs). Animal unit month is a standard unit for the amount of forage (dry weight) necessary for the sustenance of one 1,000 pound cow or its equivalent for one month.[23] About 202,200 animal unit months are permitted on National Forest System lands and about 8,000 animal unit months are permitted on associated intermingled private lands.[24] The pine savanna units provide 81 percent of the total permitted animal unit months. The Ashland Ranger District provides 61 percent of the total permitted animal unit months. Table 9 displays permitted animal unit months by unit.

Table 9. Custer Gallatin National Forest permitted use levels by managing district - (animal unit months)[25]

Managing Organization	Permitted AUMs – NFS[26]	Permitted AUMs – Waived Private Land[27]	Total AUMs
Montane			
Hebgen Lake Ranger District	288		288

[23] An Animal Unit Month or AUM is the amount of oven-dry forage (forage demand) required by one animal unit for a standardized period of 30 animal-unit-days. This would be 780 pounds dry weight forage for a 1,000 pound cow for one month (using 26 pounds/day/cow). AUM is not synonymous with animal month or head month. A Head Month (HM) is defined as one month's use and occupancy of the range by one animal. For grazing fee purposes, it is a month's use and occupancy of range by one weaned or adult cow (with or without calf,) bull, yearling steer or heifer, horse, mule or other applicable permitted animal.
[24] Term Private Land Permits are issued when the landowner waives the grazing management of their lands to the Forest Service when the private lands are incorporated into allotments when it makes a logical grazing unit.
[25] Source: Range module in NRM Infra database, user view table II_RGE_PMT_USE_V_04_01_2016 for CGNF, where permits are active; permit lines are active, modified or pending; and permit types for NFS lands are Term, Term On/Off "On" lands, Livestock Use Permits (Temp); and permit types for Waived Private Lands are Term Private Land Permits.
[26] Term, Term On/Off ("On" NFS Lands) and Livestock Use Permits (Temp).
[27] Term Private Land Permits

Managing Organization	Permitted AUMs – NFS[26]	Permitted AUMs – Waived Private Land[27]	Total AUMs
Bozeman Ranger District	7991	4301	12292[28]
Yellowstone Ranger District	10564	1852	12416[29]
Beartooth Ranger District	14854		14854
Montane Subtotal	33697	6153	14854
Pine Savanna			
Ashland Ranger District	128086	389	128475
Sioux Ranger District	40404	1441	41845
Pine Savanna Subtotal	168490	1830	170320
Grand Total	202,187	7,983	210,170

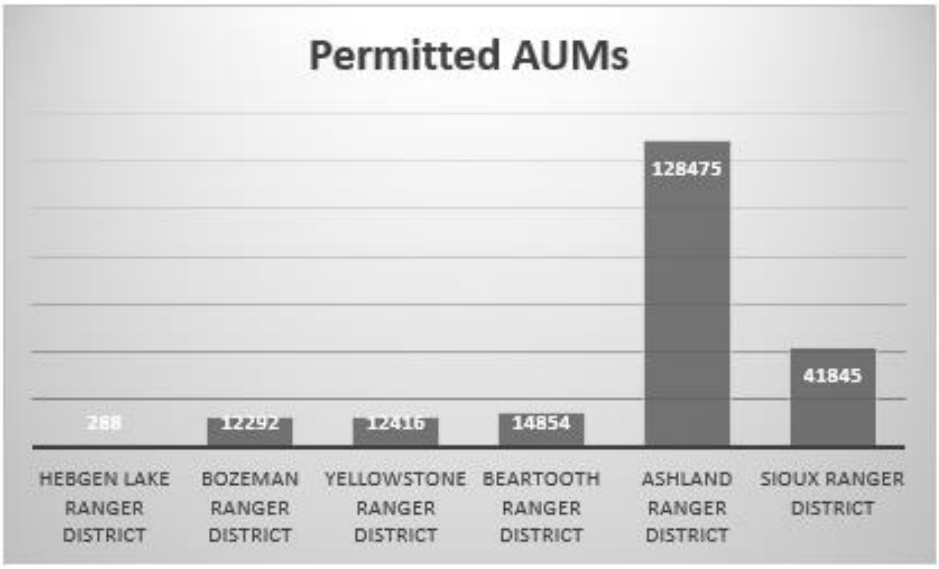

Figure 5. Permitted animal unit months by ranger district

The agency recognizes that larger cows and calves consume more forage than the 1000 pound cow AUM standard. The original theory behind determining AUMs was to make an easy standard approach for everyone to calculate stocking rates on rangelands. They took the average sized cow with calf and determined the amount of forage the animal would require. This was based on the metabolic requirements of the animal. This was also done in the 1950's and 1960's, when an average cow size was estimated to be 1000 pounds. Because of the changes in animal selection and the desire to alter the size of a cow, the average cow size has grown above 1000 pounds (Uresk 2010).

[28] Bozeman RD is the managing organization for allotments on the Bozeman RD and some allotments located in the Hebgen Lake RD. Bozeman RD total permitted AUMs are 10,204. Hebgen Lake RD total permitted AUMs are 288 that they manage and 2088 AUMs that Bozeman RD manages, totaling 2376 permitted AUMs on the Hebgen Lake RD.

[29] Yellowstone RD is the managing organization for allotments in both the Yellowstone and Gardiner RDs. Yellowstone RD total permitted AUMs are 7765 and Gardiner RD are 4651, totaling 12,416 AUMs.

For reporting purposes, the Forest Service defines an AUM as the amount of feed required by one mature (1,000 lbs.) cow or the equivalent for 1 month based upon an average daily forage consumption of 26 pounds dry matter per day (Forest Service Handbook (FSH) 2209.15, Chapter 10, Section 12, Item14). This definition is consistent with terms used by the Society for Range Management and other rangeland management agencies, universities, and professionals.

For grazing capacity and utilization purposes, forage use factors, which might include animal size, may be used and adjusted to fit site-specific conditions as determined by local officials. However, the use of forage factors is generally only pertinent when stocking a range where there has been no livestock use or where there has been management with little to no monitoring (USDA, Forest Service, 2008).

Proper stocking rates are site-specific thus they can be highly variable. Key factors influencing proper stocking on any given parcel of land include, but are not limited to: management effectiveness, topography, water availability, plant communities and their distribution, aspect, slope, forage palatability, current year's precipitation and seasonal distribution, fire (both wild and prescribed), drought, wildlife effects, recreational activities, livestock age and size, and so forth. The bottom line is that for any given allotment, proper stocking rates can and will vary significantly depending on these types of variables. Generally, a range or variability for proper stocking rates are defined, but it is nearly impossible to pinpoint one "proper stocking rate".

The Forest Service focuses its management on the land and vegetation rather than just on livestock needs. That is, for any given allotment, desired conditions are set. Then, criteria are established, based on the best available scientific information, which are designed to meet or adequately move the allotment toward desired conditions. In this context, animal size and stocking rate are only one factor out of many that is considered. Generally speaking, allowable use levels are determined as an outcome of the preparation of allotment management plans, as a result of site- specific NEPA. The concept of using allowable use as a management trigger is that when an allowable use level is reached on a key species or key area, the livestock are moved or removed. With this type of management, i.e. specifying allowable use on key species or key areas, the size of the livestock is not highly relevant. With larger animals, and a corresponding greater consumption rate, the allowable use level might be met sooner and the livestock moved off the pasture sooner than would occur with smaller animals. The stocking rate in this case becomes self regulating because management is based on meeting plant and other resource needs by meeting design criteria. Of course, there are other criteria being applied as well including seasonal restrictions, etc., all of which are designed to meet or move toward desired conditions.

With this in mind, the time that stocking rates become the most pertinent factor is when current management is unable to meet or move toward desired conditions and stocking rates become the key factor in being able to do so. In a situation such as this, data collection and subsequent calculations considers animal size and consumption rates and permitted and authorized use would be adjusted accordingly.

Since the 1986 Forest Plan timeframe, animal unit months permitted on the Custer Gallatin National Forest have decreased 23 percent. Animal unit months permitted on the Gallatin portion of the Custer Gallatin National Forest have decreased 42 percent and AUMs permitted on the Custer portion have decreased 19 percent. The changes in Gallatin units were primarily due to allotment closures of long-standing vacant allotments (See Appendix E for detailed information on allotment closures), as well as some stocking rate adjustments. The changes in the Custer units were primarily made to respond to

range readiness issues and carrying capacity / stocking rate issues. Table 10 outlines the changes in term permit levels (animal unit months) since the 1986 Forest Plan timeframe.

Table 10. Custer Gallatin National Forest changes in permitted animal unit months [30] since 1986

Unit	1986 Permit Level (AUMs)[31]	Current Permit Level (AUMs)[32]	Change in AUMs	% Change in AUMs
Gallatin NF	43,400	24,996	18,040	42% decrease
Custer NF	43,400	185,174	44,144	19% decrease
Grand Total	86,800	210,170	62,545	23% decrease

Data available for the Custer Ranger Districts show animal unit month changes since 1986 as displayed in Table 11. 1986 data for the individual Gallatin ranger districts is not readily available.

Table 11. Custer Ranger District changes in permitted animal unit months since 1986

District	1986 Permit Level (AUMs)[1]	Current Permit Level (AUMs)[1]	Change in AUMs	% Change in AUMs
Beartooth Ranger District	16,073	14,854	1219	8% decrease
Sioux Ranger District	52,016	41,845	10,171	20% decrease
Ashland Ranger District	161,226	128,475	32,751	20% decrease
Custer Units	229,315	185,174	44,141	19% decrease

These changes represent a landscape level, while at an allotment level, some allotments have sustained little to no change in stocking rates since 1986, while other allotments have undergone large stocking rate changes. Even though these changes over time helped make improvements to range condition in some areas, the remaining animal unit months are still concentrated during the growing season and continued vigilance and adaptive management will be needed to address issues. Attention is especially needed for areas with season long grazing, areas with long durations, periods of time where distribution issues may arise in riparian or green ash draws (for example, during periods of hot season use), areas where stocking rates may not be in balance with carrying capacity, and areas with other resource considerations or concerns. Because of the variability in sites, specific forage utilization guidelines for riparian, green ash woodlands, and uplands as well as other monitoring metrics used along riparian green lines such as utilization, stubble height and bank disturbance guidelines are developed and recommended by an interdisciplinary team during the allotment planning process.

Authorized Use

Permitted use typically reflects years of management, observations, and monitoring of initial stocking rates. However, annually, specific authorized use for an upcoming season may be a change from the permitted use to accommodate any need to respond to resource concerns (for example, drought or fire) or permittee convenience. It is estimated that authorized use has ranged from 65 percent to 100 percent of what is permitted. Figure 6, Figure 7, and Figure 8 display authorized use levels since 1999.

[30] AUMs = Animal Unit Months. Animal Months (AMs) are not shown in this table (aka Head Months). AMs can consist of cow/calf months (cm), sheep months (sm), horse months (hm), yearling months (ym), etc. and are converted to the standard AUM for purposes of this table comparison.

[31] Source: 1986 Custer Forest Plan and 1986 Gallatin Forest Plan

[32] Source: NRM infra database, Range Module for Term Permits

The dips in authorized use strongly correspond to responses to drought periods and large wildfire events.

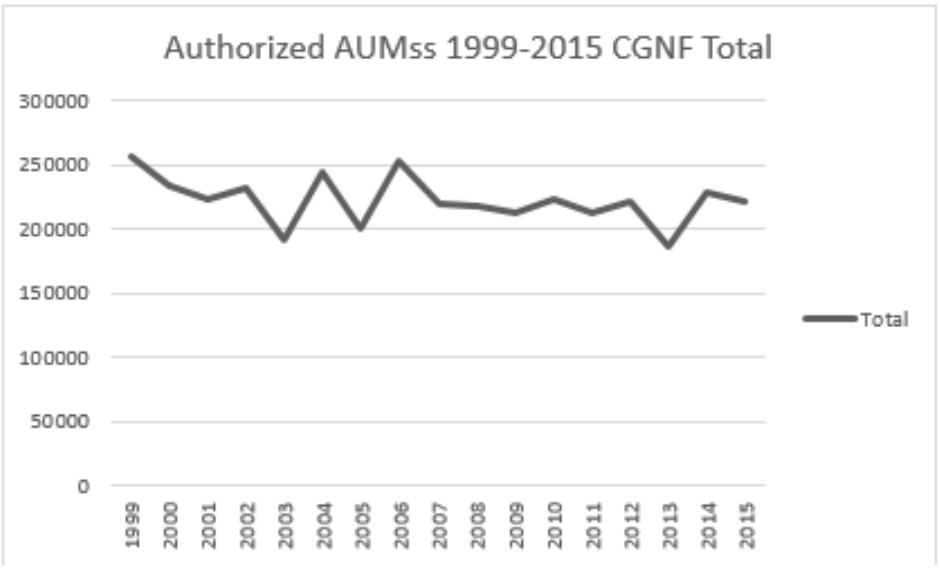

Figure 6. Authorized animal unit months for term permits from 1999 through 2015 - Custer Gallatin National Forest

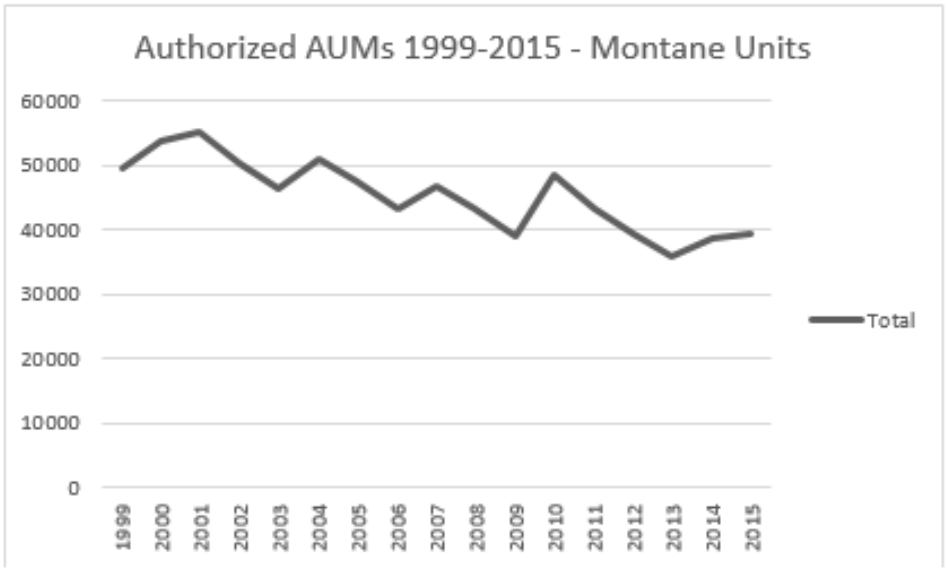

Figure 7. Authorized animal unit months for term permits from 1999 through 2015 – montane units

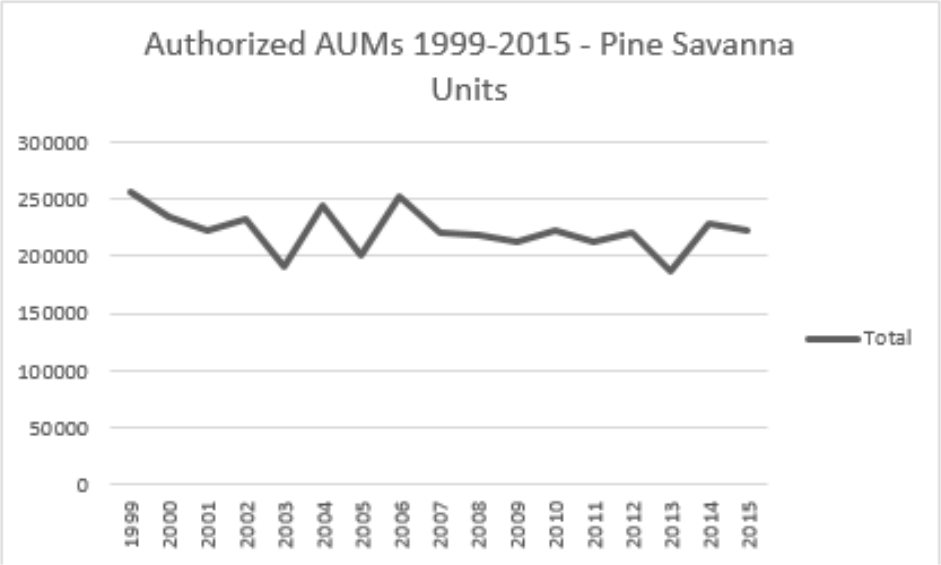

Figure 8. Authorized animal unit months for term permits from 1999 through 2015 – pine savanna units

Actual Use

The actual livestock numbers and season of use have varied greatly through time. Actual use numbers often vary from year to year and are reflective of variations in precipitation, changes for permittee convenience (late turn-outs or early removals, yearly differences in numbers of stock), and actions initiated for resource protection such as allowable utilization levels being met. Records of actual use data have been kept through history. Actual use information is used to properly assess existing management and use levels that have led to existing vegetative conditions. Actual use level is generally near the authorized use level unless events such as wildfire occur. On some districts, actual use numbers are generally close to authorized numbers, but in some cases actual use length of season have been shorter than that authorized due to fall shipping, pine needle poisoning, or fall hunting considerations.

Stocking Rates

Livestock must be managed properly to insure the long-term sustainability of the resource base. Proper grazing management depends in part on determining correct livestock numbers per area of land, known as the stocking rate. Stocking rate is often expressed as acres per animal unit month. Proper stocking rates are site-specific and can be variable. Key factors influencing proper stocking on any given parcel of land include, but are not limited to: permittee management knowledge and effectiveness, topography, water availability, plant communities and their distribution, aspect, slope, forage palatability, current year's precipitation and seasonal distribution, fire (both wild and prescribed), drought, wildlife effects, recreational activities, and livestock age and size.

The Forest Service focuses its management on the land and vegetation rather than just on livestock needs. For example, for any given allotment, desired conditions are set. Then, criteria are established, based on the best available scientific science and information, and are designed to meet or adequately move the allotment toward desired conditions. With larger animals, and presumably a corresponding greater consumption rate, the allowable use level might be met sooner and the livestock moved off a pasture sooner than would occur with smaller animals.

One evaluation is to compare similar allotments (topography, water availability, ecological setting, etc.) and their stocking rates to help examine appropriate stocking rates that meet or are moving toward desired conditions. For example, on the Ashland Ranger District, a comparison of stocking rates on primary rangeland was made for allotments found in similar ecological settings. The stocking rate ranges from 1.6 acres per animal unit month to 3.88 acres per animal unit month. In some cases, allotments that are drier and steeper are stocked differently than rolling type of grasslands with abundant water (pers. Comm., S. Studiner). Stocking rate adjustments can be made through permit modifications where there is sufficient evidence that a change is needed to move towards desired conditions.

Existing Condition

Potential vegetation communities are assemblages of plant species composition that would naturally occur in the absence of disturbance. Successional status may be the result of fire, timber harvest, introduced species, grazing, or other disturbances. Through fire, herbivory and other agents, there has always been a mix of successional stages over the landscape. Different plant and animal species are favored by vegetation in each of the classes. To maintain forest ecosystem health, a mix of ecological status classes are desired for tree dominated habitat types, maintaining some areas of lower status classes. A higher ecological status is desired for grasslands, shrublands and riparian ecosystems, because it provides an optimal mix of resource values. These resource values include: plant and animal species and structural diversity, wildlife forage and cover, soil stability and productivity, fish habitat, and usable livestock forage. Some areas classified in lower ecological status are composed primarily of introduced species such as Kentucky bluegrass, common timothy or noxious weeds.

Rangeland comprises a variety of vegetation types that produce forage, including many open-canopied woodlands, grasslands, shrublands, and riparian areas. Range condition is an assessment of the current health of the plant communities, often expressed as the degree of similarity or dissimilarity of current plant composition and abundance compared to potential or natural/historic conditions along with looking at site potential for soil and hydrologic considerations.

There is a need to recognize site capability when considering forest plan direction. Plant communities that can ultimately occupy a site are dependent upon current plant composition, the inherent potential of the soil on the site to produce specific plant communities, the probable climatic patterns and environmental processes, conditions or constraints that will likely occur, and the suite of management actions and resources available. In some areas, thresholds have been crossed where one or more ecological processes responsible for maintaining a vegetative state have degraded beyond the point of self-repair. Once a threshold has been crossed, the degree of investment and action required to reverse the transition is typically significant. Examples include: 1) areas where wildfire combined with green ash woodlands understory vegetation that have been altered by turn of the 20th century unmanaged grazing have promoted higher density sod resulting in lower likelihood of green ash establishment from seed, 2) mesic foothills that have been altered by turn of the 20th century unmanaged grazing and adjacent private land past introduction and spread of non-native timothy grass and, 3) past seeded areas that are still dominated by non-native species such as smooth brome.

Uplands

At the time of the 1986 Forest Plans, the Gallatin portion of the Custer Gallatin National Forest was estimated to have about 77 percent of suitable rangelands considered to be in good to excellent condition, while 23 percent was considered to be in fair condition (1986 Gallatin Forest Plan). The Custer portion of the Custer Gallatin National Forest was estimated to have about 66 percent of suitable

rangelands considered to be in good to excellent condition, while 32 percent was considered to be in fair condition and 2 percent in poor condition (1986 Custer Forest Plan). Many of the allotment documents detail upland conditions and were not in a format to readily aggregate at the forest level. These ratings were based on traditional rangeland surveys utilizing forage values, along with knowledge about species response to grazing pressure (increaser and decreaser species). Condition ratings did not necessarily imply site stability. Traditional range surveys and direction for assessing rangelands have changed since the 1986 Forest Plan. The attributes used to reach these ratings are not necessarily the same attributes used as indicators of rangeland integrity today. However, they are generally closely related.

At more site-specific scales, there continues to be actions implemented to improve conditions. In general, rangeland conditions overall have shown improvement over time. This is largely due to the advent of cross-fencing to move most units from season long to rotation grazing, installing offsite water developments away from riparian and hardwood draw areas, shortening the season for range readiness, reducing stocking rates to be within capacity of the land, large-scale fires across landscapes, and implementing shorter duration grazing to provide more opportunity for plant recovery.

Since the 1986 Forest Plan timeframe, animal unit months permitted on the Custer Gallatin National Forest have decreased 23 percent overall. Animal unit months permitted on the Gallatin portion of the Custer Gallatin National Forest have decreased 42 percent and animal unit months permitted on the Custer portion have decreased 19 percent. The changes in Gallatin units were primarily due to allotment closures of long-standing vacant allotments (See Appendix E for detailed information on allotment closures), as well as some stocking rate adjustments. The changes in the Custer units were primarily made to respond to range readiness issues and carrying capacity / stocking rate issues.

Various rangeland vegetation data have been collected for several range analyses across the Custer Gallatin National Forest during allotment management analysis by interdisciplinary teams. Decisions were made to implement identified mitigations needed to improve area conditions that were at issue. National Environmental Policy Act analysis and decisions have been completed on nearly all of the 234 active and vacant allotments on the Custer Gallatin National Forest. About 91 percent or 212 allotments (active and vacant) have completely incorporated Forest Plan standards and meet the current direction under the National Environmental Policy Act. Currently, the 22 allotments (15 active and 7 vacant) have been scheduled for revision over the next ten years.

In addition, since the current forest plans were approved in 1986, there have been 59 allotment closures. These allotments were vacated and closed for a variety of reasons. These include access issues, land exchanges, conflicts with wildlife values and grizzly bear conservation, and economic considerations (see Appendix E of this report for further information).

Primary rangelands in upland settings are more common than riparian and green ash woodlands. Past management practices have altered the composition and structure of plant communities and are affecting the ecological integrity in some portions of the uplands. Based on field observations and comparisons to data collected in the 1960's there has been an upward shift towards more mid grass species. However, there is still a need to continue to increase the amount of mid grass species on all allotments with less dominance of short grass species so that they exhibit closer similarity to potential in these areas. Conifer colonization into meadows, shrublands, grasslands, and interspaces has reduced usable forage in areas.

Current policy directs that land condition inventory be conducted using current ecological concepts. The ecological approach to assess rangelands is rated relative to the observed or measured attributes (17 indicators) for a site, such as floristic similarity, structure, production, bare ground, litter amount, compaction, gullying, rilling, wind scouring, and presence of invasive species. From these attributes, interpretations are made about rangeland integrity and can be described in terms of biological integrity, hydrologic function, and soil and site stability (Pellant et al., 2005). Noxious weeds, ground cover, species composition, and shrub cover were attributes tested in a Forest Service Intermountain Region study (O'Brien et. al., 2003) and proved to be viable indicators of rangeland health and functionality at a broadscale. For a consistent analysis across the Custer Gallatin National Forest plan area and based on available data the measures for key ecosystem indicators for rangeland health includes the amount of noxious weeds and bare ground.

Noxious weeds are present on most allotments, most notably along roadways and in past wildfire areas. For more detail, see the Invasive Plants Report (Lamont and Reid, 2017).

Ground cover (basal vegetation, wood, rock, moss/lichen/crusts, and litter) aids in soil stability and minimizes water and wind erosion. Bare ground does not aid in soil stability. Water and wind erosion decreases as vegetation cover increases due to increased water available for plant growth. When soils are dry and plant cover is low, potential erosion is high from both wind and water. Below 70 percent ground cover, erosion potential is greatly exacerbated (Marshall, 1973; Robichaud et. al., 2010). Enderlin and others (1962) also describe that ground cover between 70 and 100 is good, ground cover between 30 and 70 is fair, and ground cover between 0 and 30 is poor as adjective ratings. On the Gallatin elk winter range in Montana, ground cover of at least 70 percent was considered necessary for restoring and maintaining soil stability (Packer, 1963).

Mueggler and Stewart's (1988) classification of grasslands and shrublands of Montana describes bare ground data for 30 non-forested habitat types found on the Custer Gallatin National Forest which depict reference conditions relative to the site's inherent capabilities. Bare ground in reference condition grassland types averaged 7 percent and ranged from 0 to 42 percent. In the sagebrush types bare ground averaged 9 percent and ranged from 1 to 32 percent. Skunkbush types average bare ground averaged 5 percent and ranged from 1 to 18 percent. Hansen and Hoffman's (1988) habitat type classification of grasslands and shrublands describes bare ground data for 26 non-forested habitat types found on the Ashland and Sioux Districts which depict reference conditions. Bare ground in reference condition on two juniper types ranged from 34 to 70. In two Wyoming big sagebrush types, bare ground ranged from 0 to 44 percent. The silver sage type's bare ground ranged from 1 to 16 percent.

Presence and amount of bare ground is a key indicator for overall ecosystem health. Basic ground cover and bare ground data were captured for 3,788 ocular macroplots during various vegetation inventories (in both forested and non-forested types). The inventories included rangeland inventories, satellite imagery validation (Silc/Vmap), and other legacy inventories. Bare ground ranging from 0 to 10 percent cover was found on 81 percent of the plots, bare ground ranging from 11 to 20 percent was found on 10% of the plots, bare ground ranging from 21 to 30 percent was found on 4 percent of the plots, bare ground ranging from 31 to 40 percent was found on 2 percent of the plots and bare ground ranging from 41 to 100 percent was found on 3 percent of the plots. Ninety-five percent of the overall plots had 30 percent or less bare ground with 81 percent being at ten percent or less. Table 12 outlines the percent of plots in relation to bare ground amount.

Table 12. Percent of plots by bare ground amount

Range of Bare Ground %	0-10%	11-20%	21-30%	31-40%	>40%
Gallatin Portion - Percent of Plots (n-=647)	85%	8%	3%	2%	2%
Custer Portion - Percent of Plots (n=3141)	80%	11%	4%	2%	3%
CGNF – Total Percent of Plots (n=3788)	81%	10%	4%	2%	3%

See the Terrestrial Ecosystems – Non-Forested Vegetation report (Reid, 2017) which provides an overall indication of conditions.

Riparian / Wetlands

Information collected during riparian/wetland area proper functioning condition (USDI, 1998; USDI, 2003) assessments was used to generate estimates of conditions relative to the key ecosystem characteristics identified to represent riparian. See the Aquatics and Riparian Ecosystems Report (Barndt, Reid, and Chaffin, 2017) and Appendix B of this report for current protocols and ecological concepts for assessing riparian and wetland conditions. Table 13 summarizes existing condition of riparian and wetlands within grazing allotments.

Table 13. Inventoried riparian summary

Landscape Area	Proper Functioning Condition	Functional-At Risk			Nonfunctional			Total # Surveys
	No Apparent Trend	Downward Trend	No Apparent Trend	Upward Trend	Downward Trend	No Apparent Trend	Upward Trend	
Montane								
Madison, Henry's, Gallatin, Absaroka and Beartooth Mtns	54	4	12	8	0	3	2	83
Bridger, Bangtail, Crazy Mtns	16	1						17
Pryor Mtns	96	1	31	0	0	2	0	130
Subtotal	166	6	43	8	0	5	2	230
Pine Savanna								
Ashland	8		7					15
Sioux	10		6					16
Subtotal	18	0	13	0	0	0	0	31
Grand Total	184	6	56	8	0	5	2	261

Within the primary rangelands permitted for grazing in the overall assessment area, 71 percent of the survey sites were in proper functioning condition, with 27 percent functioning at risk and 2 percent rated as non-functional. Within the montane units, 72 percent of the survey sites were in proper functioning condition, with 25 percent functioning at risk and 3 percent rated as non-functional. Within the pine

savanna units, 58 percent of the survey sites were in proper functioning condition, with 42 percent functioning at risk and none rated as non-functional. Management decisions for addressing non-functional sites are typically through minor fencing or other applicable mitigation relative to grazing impacts. Management decisions for addressing the at "risk" sites generally involve a mix of grazing prescription changes such as reduced stocking rate, improved distribution techniques such as proper salting and off-site water development, along with reduced grazing duration and timing considerations. The "at risk" and non-functional sites are largely a function of legacy issues, including roads, uncharacteristic wildland fire, developed recreation, dispersed recreation, historically unmanaged grazing by livestock, water development, and/or water diversion. However, this does not discount that there continues to be a need for improved grazing practices and monitoring in riparian areas along streams and in wetlands since there are still some season long grazing allotments; some allotment pastures on the Ashland and Sioux Districts have long durations, and some long duration of use during the hot season when distribution tends to be on the valley bottoms in riparian and green ash draws.

Trends in riparian conditions are difficult to identify based on one site visit. Trends can generally be inferred (apparent trend), based on known changes in livestock management, or known disturbance events. Five percent of the riparian sites surveyed in the overall assessment area were considered to be in downward trend. In general, the trends for all riparian is up from a long-term perspective due to decreases in stocking rates over past decades, rest due to periodic non-use, and natural recovery from past wildfire events. However, the current trend for most reaches is considered not apparent.

Green Ash Woodlands

As an uncommon and biologically important landscape component, green ash woodlands should be managed to maintain or perpetuate a network of multi-layer and multi-age class of herbaceous plants, shrubs, and trees. Predominant species included in the draws are green ash, box elder, hawthorn, wild plum, chokecherry, and snowberry. These systems associated with deciduous tree stands should be properly functioning or in an upward trend within the capability of the site. Functioning systems will help maintain diverse plant and animal communities. Sites that have lost the capability of improvement (without extremely high investment and energy) generally occurs where sod, often Kentucky bluegrass, impedes seedling establishment (non-functional sites). Priority for restoration efforts should be placed at sites that are functional but at risk to get the biggest return on investment. The healthier woodlands have a relatively dense tree canopy, ash trees of all ages and understories dominated by chokecherry, wild plum, hawthorn, serviceberry, Sprengel's sedge, and shade-loving forbs. Most ash woodlands are intermediate in composition between these two extremes. Activities in these systems should maintain long-term soil productivity and properly functioning water cycles characterized by high infiltration rates, low soil compaction, and minimal overland flows. Canada thistle and other associated invasive species should be targeted for reduction.

Evidence from studies throughout the Northern Great Plains between 1978 and the present suggest that the majority of green ash woodlands have declined (Lesica and Marlow, 2013). Many of those in eastern Montana and the adjacent Dakotas are relatively open with few young trees and understories dominated by snowberry, grassland forbs, and rhizomatous, usually exotic grasses. Legacy issues such as turn of the 20th century unmanaged grazing have contributed to current conditions in many areas. There is a need to recognize site capability when considering management activities for improvement. Plant communities that can ultimately occupy a site are dependent upon current plant composition, the inherent potential of the soil on the site to produce specific plant communities, the probable climatic patterns and environmental processes, conditions or constraints that will likely occur, and the suite of management actions and resources available. In some areas, thresholds have been crossed where one or more ecological processes responsible for maintaining a vegetative state have degraded beyond the

point of self-repair. Once a threshold has been crossed, the degree of investment and action required to reverse the transition is typically significant. Areas where wildfire combined with green ash woodland understory vegetation that have been altered by turn of the 20th century unmanaged grazing have promoted higher density sod resulting in lower likelihood of green ash establishment from seed.

Green ash woodlands occur on about 8260 National Forest System acres on the Sioux District and about 670 acres on the Ashland District. Measurements gathered from green ash health surveys were used to generate estimates of conditions relative to the key ecosystem characteristics identified to represent green ash woodlands in the assessment area. See Appendix C of this report for current protocols and ecological concepts for assessing green ash woodland conditions.

On the Sioux District, 137 sites were inventoried of which 21 percent were found to be functioning, 63 percent were "at risk", and 22 percent were non-functional. On the Ashland District, of the 299 acres inventoried, approximately 16 percent were considered healthy, 59 percent considered at risk, and 25 percent considered not functioning. When averaging these two pine savanna units, 19 percent of inventoried areas are functional, 61 percent are "at risk", and 20 percent are non-functional. Table 14 summarizes these findings.

Table 14. Summary of green ash woodlands condition ratings

	Functional	Functional at Risk	Non Functional	Total
Sioux Ranger District				
# of Sites Surveyed	29	86	22	137 Sites
Percentage of Inventoried Sites by Condition	21%	63%	16%	
Ashland Ranger District				
Acres Surveyed	49	175	75	299 Ac
Percentage of Inventoried Acres by Condition	16%	59%	25%	
Pine Savanna Unit (Sioux and Ashland Combined)				
Average Percentage Inventoried areas by Condition	19%	61%	20%	

The Sioux and Ashland Districts have experienced large scale wildfires in the past 28 years that have affected green ash woodlands. Some stands in the Long Pines of the Sioux District experienced reburn effects as well (1988 Brewer Fire and 2002 Kraft Springs Fire) setting back recovery. Postfire recovery depends largely on the pre-fire conditions in the ground level understory. Many of these burned stands had enough sod development to impede green ash seedling/sapling establishment that it is unlikely that functional stand conditions will return in these areas. On the other hand, the post-fire conditions in the Long Pines are showing a large release and increase in aspen stands that were previously not well represented on the landscape in recent history. Where green ash recovery in post burn settings appears to be the best is where there is less sod and more pine litter/duff as seen in the Ekalaka Hills Dugan Fire on the Sioux District.

Key Benefits to People

Rangelands

Rangeland ecosystem goods and services affect people across economic, social and cultural and environmental boundaries. For example, people profit from the sale of ecosystem goods such as food and fiber, biofuels feedstocks and biochemicals extracted from plants. Rangelands also generate intangible benefits such as the pleasure that people take in observing plants and wildlife, studying natural systems and hunting and fishing (Maczko and Hidinger, 2008). These intangible benefits include the sense of wonder and spiritual connection that many people feel when immersed in rangeland landscapes. See the Terrestrial Ecosystems – Non-Forested Vegetation Report (Reid, 2017) for further detailed discussion of rangeland components.

Grazing

Grazing ecosystems evolved with herbivory, heavy hoof action, nitrogen deposits, and decomposing carcasses of large migratory ungulates. When introduced into ecosystems that did not evolve with frequent grazing, these forces can alter biological communities and ecosystem function. As such, livestock herbivory, physical impact, and deposition can have impacts on ecosystems. In human-controlled grazing systems, the detrimental or beneficial effects of grazing are largely determined by how and where grazing is used. The negative impacts of livestock grazing are often the result of uncontrolled or improper use such as persistent overgrazing. The ecological impacts of livestock grazing depend on the type of ecosystem, plant community, and conditions of a particular site.

Other general impacts include potential for displacement and forage competition with native herbivores, conflicts with recreational values, and weed spread. As with any species, wild or domestic, livestock can carry a number of pathogens or parasites that can be transmitted to other species and visa versa (Adams and Dood, 2001). Parasitic diseases can be expected to continue in consideration of climate change (Hoberg et. al, 2008). Livestock naturally tend to congregate in biologically important areas, such as riparian areas and green ash draws, and therefore are important areas to place special emphasis on their management.

General benefits of livestock grazing include profit from the sale of ecosystem goods such as food and fiber, and receipts from annual grazing fees that are shared with state and local governments. Livestock grazing can contribute to fire hazard reduction by controlling the amount and distribution of grasses and other potential fine fuels. Without disturbance such as grazing, grasslands can accumulate large amounts of dead plant material (thatch) that can reduce the successful establishment of a diversity of native grasses and forbs. Proper management of livestock grazing and related infrastructure such as water developments can provide for various wildlife needs. Feedbacks between sustainable ecosystem goods and services and ecological and social/economic processes are usually complex and nonlinear. Perceived benefits of a particular ecosystem service will vary from person to person or from time to time based on individual and social values.

The modern history of the west is very closely tied to livestock grazing. During the 1800s, large ranching operations were established using the free forage available on unmanaged and unclaimed public domain lands. While the dominance of these cattle and sheep "empires" declined after restrictions on grazing began to occur in the early part of the 20th century, much of the custom and culture of the rural west is still very closely tied to ranching. Many rural communities continue to be dependent upon ranching for their economic livelihood and most of these ranches rely on federal land grazing, either on Bureau of Land Management-managed lands or on national forests, for at least a portion of the grazing.

Livestock-grazing in the Ashland and Sioux regions is important because it is the primary and nearly exclusive economy. Without the national forest, many of our permittees would have difficulty sustaining a viable operation because of their dependence on national forest allotments.

It is the Forest Service's goal to conserve the rich natural resources while supporting communities greatly dependent upon these very same resources. While grazing is an important use, the Forest Service will continue to move forward with improving management and preventing degradation of soil, water, and vegetation.

Livestock that graze the Forest, generally during the summer months, are typically provided forage from private lands and some Bureau of Land Management and State lands during the remainder of the year. Forage from private lands during this period is in the form of native grass pasture, irrigated pasture, and fall crop residue.

Charging fees for grazing private livestock on federal lands is a long-standing but contentious practice. Generally, livestock producers who use federal lands want to keep fees low, while conservation groups and others believe fees should be increased[33]. The formula for determining the grazing fee for lands managed by the Bureau of Land Management and the Forest Service uses a base value adjusted annually by the lease rates for grazing on private lands, beef cattle prices, and the cost of livestock production. Annual grazing fees for authorized use on federal lands in the West have ranged from the base level of $1.35 per head month to $2.11 per head month in the past several years[34]. Over several decades, the fees charged on U.S. federal rangelands have generally been substantially lower than rates charged on private lands[35] in the U.S.

The receipts from annual grazing fees, in accordance with legislative requirements, are shared with state and local governments. Twenty five percent goes to associated counties and 25 percent to the U.S. Treasury, while fifty percent of grazing fee income is returned as range betterment funds to the region/forest which generated the income. Range betterment funds established by Title IV, section 401 (b)(1), of the Federal Land Policy and Management Act of 1976 to be used for rangeland improvement. Range betterment funds are to be used to arrest range deterioration and improve forage conditions with resulting benefits to wildlife, watershed protection, and livestock production. This consists of 50 percent of all money received by the United States as fees for grazing livestock on the National Forests in the 16 contiguous western states. Annual gross receipts from grazing fees on the Custer National Forest from 2001 to 2014 ranged between $131,800 and $259,000 and receipts from grazing fees on the Gallatin National Forest from 2001 to 2014 ranged between $18,643 and $40,233 (Economic Profile System, 2016).

[33] In 1978 the Public Rangelands Improvement Act (PRIA) was passed, which provided a formula for setting grazing fees on both Forest Service and BLM lands in 16 western states.1 After a trial period of seven years, this formula was made permanent by Executive Order 12548 (Feb. 14, 1986). Executive Order 12548 established a fee minimum of $1.35 per Head Month, and provided that annual fee adjustment could not exceed 25 percent of the previous year's fee. (Vincent, 2012). The application of the PRIA fee formula has ultimately led to BLM and USFS grazing fees that increasingly diverge from rates charged by private landowners as well as other federal and state agencies. Federal fees are not generally comparable to fees for leasing private rangelands, because public lands often are less productive; must be shared with other public users; and often lack water, fencing, or other amenities, thereby increasing operating costs.

[34] Over the last 35 years, 18 of the year's annual grazing fee has been at $1.35 base rate, while 17 of the years have been above that base rate, but below $1.99 per head month (Vincent, 2012).

[35] For Montana, the grazing fee for a cow/calf pair can be as high as $26 per cow/calf month. For South Dakota, the grazing fee for a cow/calf pair can be as high as $39 per cow/calf month (USDA, NASS, 2016).

Importance to People in the Broader Landscape

Custer-Gallatin National Forest multi-county region assessed in the Social/Economics Report (Larson and Rasch, 2017) stretches across southcentral and southeastern Montana, and into South and North Dakota. The multi-county region includes: Big Horn, Carbon, Carter, Custer, Fallon Gallatin, Madison, Meagher, Park, Powder River, Rosebud, Stillwater, Sweet Grass, Wheatland, and Yellowstone County of Montana; and Harding and Bowman County of South and North Dakota, respectively. Within this multi-county region, agriculture is an important economic sector. Demand for future permitted grazing is expected to increase, but not at the same rate as demand for other services including recreation. See the Social / Economics Report (Larson and Rasch, 2017) for further detail.

Rural counties with greater proportions of federal land are typically more dependent, economically and otherwise, on land management policies. Federal lands represent a significant holding in certain counties including: Big Horn and Park County Wyoming, Madison, Meagher, Gallatin, Carbon, Carter, Powder River, and Park Counties in Montana. The plan area produces a significant amount of revenue for local governments through employment income and directly through federal land payments which includes a portion from grazing fees. Federal land payments compensate governments for non-taxable federal land within their borders and payments are funded by federal appropriations. Types of federal land payments include payments in lieu of taxes (PILT), Forest Service and other agency revenue sharing, and federal mineral royalties which are distributed by the U.S. Office of Natural Resource Revenue (see Larson and Rasch, 2017. Social/Economics Report, Appendix A, Tables 12 and 13). These programs can represent a significant portion of local government revenue in rural counties with large federal land holdings. Federal land payments have the potential to change and be influenced by land management policy.

About 20 percent of beef cattle in the United States, or six million head, are in the eleven western states (Skaggs, 2008). It is estimated that the producers in the assessment area's economic region rely on forage produced on NFS lands similar to that of other places in the west. The U.S. Forest Service has estimated that less than 10 percent of total national forage consumption by livestock is provided by public lands (USDA Forest Service, 2010). It is estimated that there is an annual production of 11 million pounds of beef produced on the Forest with close to 6 million of that being produced on the Ashland District[36]. Torell, Fowler, Kincaid, and Hawkes (1996) estimated that 15 percent of the nation's beef cows and 44 percent of the sheep and lambs were produced on public land ranches, that approximately 5 percent of the nation's grazing capacity comes from Bureau of Land Management and National Forest System lands, and that 4 percent of the forage for the nation's beef cow herd is supplied by these lands. While neither the overall national beef cow herd nor the national beef supply is greatly dependent upon public rangelands, many individual ranching operations in the intermountain West are almost 100 percent dependent upon total annual or seasonal forage provided by publicly–owned rangelands. Torell, Fowler, Kincaid, and Hawkes (1996) also concluded that 41 percent of beef cows in the eleven western states grazed on federal lands for part of the year, and that 19 percent of the total annual forage demand in the region was met from federal land. See the Social / Economics Report (Larson and Rasch, 2017) for further information.

Trends and Drivers

Over the next 50 years, certain environmental influences may negatively impact allotment condition and forage production. If temperatures continue to increase, there may be changes in vegetation, shifting from more mesic plant associations to more xeric communities, better adapted to the drier sites.

[36] Assumes a 300 pound gain in cattle while they are on the Forest (pers. comm., M. Stevens, 2017).

Invasive weeds may continue to spread and increase in abundance and density. Timber canopy may continue to close in areas where wildfires or other disturbances do not occur, and some grasslands/shrublands may see additional conifer encroachment and conversion to a timber-dominated community. Conversely, there is potential that wildfire may play a larger role in shaping vegetation in some areas, perhaps promoting nonforested vegetation communities, particularly given warmer climate regimes. Transitory range acreage will fluctuate: timber stands will become more open due to harvest, insects, and/or fire; with time and succession, overstory canopies will close in once again.

Recent large fires have changed the amount and pattern of forest cover across much of the Ashland and a portion of the Sioux Ranger Districts (i.e. the Long Pines 1988 Brewer Fire and 2002 Kraft Springs Fire) with smaller proportions across the other districts (i.e. the 2006 Derby Fire). About a third of the Ashland District burned in the 2012 Ash Creek and Taylor Creek Fires. Previous fires, dating back to the mid-1990s burned roughly another third of the Ashland District, including some areas that burned again in 2012. In total, nearly 60 percent of the Ashland landscape has been affected by large fires since 1995. These recent, large fires have changed the amount and distribution of forest cover across the landscape, reducing the proportion of forest cover from approximately 40 percent in 1995 to about 25 percent today (USDA Forest Service 2014). This change in forest/grassland ratio in these large fire areas have likely influenced wildlife species diversity, abundance, and distribution as well as livestock distribution. Burned forested areas will transition back to forest cover types as they shift from grass and forb cover to shrub cover and eventually shift back to tree cover over time. This shift back to tree cover depends on the seed source that remains post-fire. North, northeast, and east aspects will likely sprout mesic shrubs with very little grass forage. West, southwest and south aspects will likely express a grass/forb cover longer. See the– Non-Forested Terrestrial Ecosystems Report (Reid, 2017) which includes further details about the stability or resiliency of the ecosystems connected to rangelands and influence of associated ecosystem drivers such as fire, drought, and herbivory.

Livestock grazing, especially cattle, is likely to still be desired by the local livestock industry within the assessment area over the next many years, due to the scarcity of privately held forage that is available for lease. This should continue to be especially true for livestock operators whose private lands are adjacent to Custer Gallatin National Forest. The amount of permitted livestock grazing may decline to some degree, due to reduced forage capacity (invasive weeds and tree canopy closure), future management actions initiated by the Forest, and tighter administrative constraints for protection and enhancement of threatened, endangered, and sensitive species habitat and other resource concerns such as water quality. The intensity, duration, and timing of livestock grazing could notably affect resource conditions, including forage plant health and sustainability; upland, riparian, and green ash woodland condition and function; and soil productivity and stability. The administration of livestock grazing by the Custer Gallatin National Forest to ensure the maintenance or improvement of resource conditions will continue. The use of adaptive management options to reach site specific conditions will be necessary to guide livestock management and reach desired ecological conditions.

Information Needs

Forest Plan Information Needs: None identified.

Long-term Information Needs: Analysis of the herbaceous composition and trend data will need to be made at the individual grazing allotment level when allotment management plans are developed or when monitoring deems that changes are needed through permit modifications. This will allow for site specific management practices to be examined and put in place to ensure desired community attributes are achieved.

Monitoring of key ecosystem characteristics, such as changes in bare ground, should be conducted using forest inventory and analysis data forest-wide and for all allotments by cover type and by habitat type, also at the allotment scale.

Key Findings

The Custer Gallatin National Forest works with 199 permit holders on 216 active livestock grazing allotments in nine counties and two states. Roughly 36,200 head of cattle, 550 horses, and 400 domestic bison are permitted to graze at various times throughout the year on National Forest System lands and associated private lands. There are 216 active and 18 vacant livestock grazing allotments, with primary rangeland covering approximately 22 percent of the Custer Gallatin. More livestock grazing occurs on the eastern two districts than the western part of the Custer Gallatin National Forest. For instance, 81 percent of the 202,200 permitted animal unit months occur on the Ashland and Sioux Districts.

Many rural communities continue to be dependent upon ranching for their economic livelihood and most of these ranches rely on federal land grazing. Without the Custer Gallatin National Forest, many of the permittees would have difficulty sustaining a viable operation because of their dependence on National Forest allotments.

Past land use and management actions have influenced rangeland conditions we see today. This includes overuse from unmanaged livestock grazing from the 1880s to 1930s. For example, Pryor Mountains grazing records indicate that current forage removed by permitted livestock is about 14 percent of early-1900s levels. During the 1940s to 1960s many stocking rate reductions, cross-fencing, and water developments were implemented to help improve conditions. Other changes since the mid 1980s include allotment closures (59), further livestock use reductions (23%), additional fencing and water installations, distribution improvement practices, reduced durations and improved timing, pasture rotations, and breaks in use.

Rangelands in grazing allotments can be categorized into three broad groups: uplands (grasslands, shrublands, and open canopied pine savannas), riparian (streamside water-dependent vegetation) and wetland areas, and green ash woodlands, also known as woody draws. Potential ecosystem stressors to these areas include invasive plants, grazing, wildfire, periodic drought and a warmer climate.

Over time, desirable species have become more widespread and less desirable species have been reduced in uplands. Ground cover measurements are generally within acceptable limits. Conifer colonization into meadows, shrublands, grasslands, and interspaces has reduced usable forage in some areas. While upland conditions today have improved overall, there are places where conditions can be further improved.

Areas prone to livestock concentration typically occur in riparian and green ash woodlands. In recent studies, 71 percent of riparian survey sites were found to be in functioning condition (meaning conditions are more resilient to ecosystem stressors), 27 percent were found to be functioning but at risk (meaning that improvement could be made to transition back to functioning condition) and 2 percent were nonfunctional (meaning that ecological processes have degraded beyond the point of self-repair). In recent surveys of green ash woodland sites on the Ashland and Sioux Districts, 19 percent were found to be functioning, 61 percent were functioning but at risk, and 20 percent were nonfunctional. Because of lower stocking rates (the number of animals permitted on a given amount of land over a certain period of time), breaks in grazing use and other management tools, conditions in

these areas are generally improving. However, there continues to be a need for improved grazing practices and monitoring in riparian areas and green ash woodlands.

The above riparian and green ash draw condition categories are from various rangeland vegetation data that have been collected across the Custer Gallatin National Forest during allotment management analysis by interdisciplinary teams. Decisions were made to implement identified mitigations needed to improve these area conditions that were at issue. National Environmental Policy Act analysis and decisions have been completed on nearly all of the 234 active and vacant allotments on the Custer Gallatin National Forest. About 91 percent or 212 allotments (active and vacant) have completely incorporated Forest Plan standards and meet the current direction under the National Environmental Policy Act. Currently, the remaining 22 allotments (15 active and 7 vacant) have been scheduled for National Environmental Policy Act analysis over the next ten years.

Even though improvements to conditions have been made over the long term, conditions vary widely allotment by allotment. Site specific allotment analysis determines future permitted use adjustments, where applicable. Potential adjustments could be from potentially more stringent management constraints relative to threatened, endangered, or other at risk species, and from loss of forage brought about by trends in conifer canopy closure, conifer colonization into grassland communities and potential invasive weed spread. In areas of past and potential wildfires, resulting livestock distribution away from concentrated use areas often provides improvement to conditions.

There is a need to recognize site capability when considering management activities for improvement. Plant communities that can ultimately occupy a site are dependent upon current plant composition, the inherent potential of the soil on the site to produce specific plant communities, the probable climatic patterns and environmental processes, conditions or constraints that will likely occur, and the suite of management actions and resources available. In some areas, thresholds have been crossed where one or more ecological processes responsible for maintaining a vegetative state have degraded beyond the point of self-repair. Once a threshold has been crossed, the degree of investment and action required to reverse the transition is typically significant.

Although many management changes have been made over time to improve rangeland conditions, management prescriptions will continue to be fine-tuned. By continually monitoring conditions and making incremental changes, managers can help restore and maintain ecosystem health and promote resiliency to drought, wildfire and other stressors.

Drought impacts rangeland ecosystem functioning and resilience through effects on water availability, soil integrity, habitat, wildlife populations, livestock, and humans. Drought influences the likelihood and dynamics of other stressors and disturbances such as insect outbreaks, invasive species, wildfire, and human land uses. Drought often requires adjustments in methods for managing livestock and restoring plant communities. Periodic drought will continue to require temporary management shifts in reduced numbers and/or reduced duration of permitted use. Over the last decade, authorized use averaged 85% of permitted use to respond to periods of drought, wildfire, and permittee personal convenience non-use.

Larger future wildfires can substantially increase costs to the permittee and to the Forest Service associated with allotment infrastructure maintenance, such as fence repair and acquiring forage elsewhere until post-fire recovery and infrastructure repair occurs.

Special grazing management considerations occur in certain areas such as bison tolerance zones, the grizzly bear recovery zone, critical wildlife habitat and designated wilderness areas.

Grazing is one of the longest uses of the Custer Gallatin National Forest and it is important to many ranchers and nearby communities. Although the individual Custer and Gallatin forest plans both contain still-relevant direction for rangeland and grazing management, the forest plan revision process provides an opportunity to make the overall plan more consistent and integrated with other national forest objectives. The goal is to balance grazing needs with sustainability, habitat protection and other national forest obligations, with a special focus on sensitive and biologically important areas such as riparian areas and green ash woodlands. Continued monitoring and analysis of rangeland trends for each grazing allotment is important to ensure that the rangeland resource is headed in the desired direction of improved health and resilience to ecosystem stressors.

References

Adams, S.M. and A.R. Dood. 2011. Background Information of Issues of Concern for Montana: Plains Bison Ecology, Management, and Conservation. Montana Fish, Wildlife, and Parks, Bozeman, Montana. 167 pp.

Archer, Eric K.; Van Wagenen, Andrew R.; Coles-Ritchie, Mark; Ebertowski, Peter; and Leary, Ryan J. 2014. Effectiveness monitoring for streams and riparian areas: sampling protocol for vegetation parameters. Unpublished paper on file at: http://www.fs.fed.us/biology/fishecology/emp.

Barber, J., R. Bush, D. Bergland. 2011. The Region 1 Existing Vegetation Classification System and its Relationship to Region 1 Inventory Data and Map Products. 39 pp.

Biswas, T. J. DiBenedetto, S. Brown, A. Yeager, R. Hamilton, H. Fisk. 2012. Procedures for Mapping Rare Vegetation Types Using Mid-Level Vegetation Maps. RSAC-10005-RPT1. Remote Sensing Applications Center (RSAC). 13 pp.

Burton, T. A., S.J. Smith and E.R. Cowley. 2011. Multiple Indicator Monitoring (MIM) of Stream Channels and Streamside Vegetation. Bureau of Land Manage. Technical Ref. 1737-23.

Dickard, M., Gonzales, M., Elmore, W., Leonard, S., Smith, D., Smith, S., Staats, J., Summers, P., Weixelman, D., & Wyman, S. 2015. Riparian area management: Proper functioning condition assessment for lotic areas (Technical Report No. 1737-15 v.2). Denver, CO, USA: US Department of the Interior, Bureau of Land Management.

Elmore, W. and R.L. Beschta. 1987. Riparian Areas: Perceptions in Management. Rangelands. Vol. 9, No. 6, December, 1987. pp 260-265.

Girard, M.M., H. Goetz, A.J. Bjugstad. 1989. Native Woodland Habitat Types of Southwestern North Dakota. 21 pp.

Haigh, J.C., C. Mackintosh, and F. Griffin. 2002. Viral parasitic and prion diseases of farmed deer and bison. Rev. Sci. Tech. Off. Int. Epiz. 2002. 21 (2). 219-248. 30 pp.

Hanson, P.L. and G.R. Hoffman. 1988. Vegetation of the Grand River/Cedar River, Sioux, and Ashland Districts of the Custer National Forest. Fort Collins, Colo. U.S. Dept. of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station.

Hoberg, E.P., L. Polley, E.J. Jenkins, and S.J. Kutz. 2008. Pathogens of domestic and free-ranging ungulates: global climate change in temperate to boreal latitudes across North America. Rev. Sci. Tech. Off. int. Epiz., 2008, 27 (2), 511-528.

Hodorff, R.A. 1985. Wildlife response to stand structure of green ash woodlands. M.S. Thesis, South Dakota State University, Brookings, SD. 60pp.

Holechek, J. L., R. D. Pieper, and C. H. Herbel. 1998. Range management principles and practices. 3rd edition. Prentice Hall. 542pp.

Kamath, P.L., J.T. Foster, K.P. Drees, G. Luikart, C. Quance, N.J. Anderson, P.R. Clarke, E. K. Cole, M. L. Drew, W.H. Edwards, J.C. Rhyan, J.J. Treanor, R.L. Wallen, P. J. White, S. Robbe-Austerman, and P.C. Cross. 2016. Genomics reveals historic and contemporary transmission dynamics of a bacterial disease among wildlife and livestock.

Lesica, P. and C. Marlow. 2013. Green Ash Woodlands. A Review. Montana State University Extension. Research Bulletin #4601. 20 pp.

Maczko, K., and L. Hidinger (editors). 2008. "Sustainable rangelands: Ecosystem goods and services. Sustainable Rangelands Roundtable." SRR Monograph No. 3. 94 pp.

Meehan, M.A., K.K. Sedivec, G.A. Hecker, and J.L. Printz. 2016. Riparian complex ecological sites of North Dakota: a pictorial guide of riparian complex sites common in North Dakota. North Dakota State University Extension Service, North Dakota State University, North Dakota. 24 pp.

Meyer, C., D.H. Knight, and G.K. Dillon. 2006. Historic Variability for the Upland Vegetation of the Shoshone National Forest, Wyoming. Department of Botany, University of Wyoming, Laramie, WY. 182 pp.

Montana Natural Heritage Program. 2016. National Wetland Inventory. Data accessed in 2016. http://mtnhp.org/nwi/

Prichard, D., J. Anderson, C. Correll, J. Fogg, K. Gebhardt, R. Krapf, S. Leonard, B. Mitchell, and J. Staats. 1998. Riparian area management: a user guide to assessing proper functioning condition and the supporting science for lotic areas. TR 1737-15. Bureau of Land Management, BLM/RS/ST-98/001+1737. 136 pp.

Prichard, D., F. Berg, W. Hagenbuck, S. Leonard, M. Manning, R. Leinard, and J. Staats. 2003. Riparian area management: a user guide to assessing proper functioning condition and the supporting science for lentic areas. TR 1737-16. Bureau of Land Management, BLM/RS/ST - 99/001+1737+REV03. 110 pp.

Reid, K, D. Sandbak, A. Efta and M. Gonzales. 2016. Vegetation Groupings for CGNF Plan Revision and Metadata for Adjustments made to VMAP. Unpublished document. 41 pp.

Reid, K. 2016. Grazing and Range Management History of Pryor Mountain Allotments. Unpublished document. 32 pp.

Robichaud, P.R., MacDonald, L.H., and Foltz, R.B. 2010. Fuel Management and Erosion. In: Elliot, William J.; Miller, Ina Sue; Audin, Lisa. Eds. 2010. Cumulative watershed effects of fuel management in the western United States. Gen. Tech. Rep. RMRS-GTR-231. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 299 p.

Rosgen, D. 1996. Applied river morphology. Wildland Hydrology, Pagosa Springs, CO. 390 pp.

Rumble, M. A., C. H. Sieg, D. W. Uresk and J. Javersak. 1998. Native woodlands and birds of South Dakota: past and present. USDA Forest Service. Rocky Mountain Research Station Research Paper RMRS-RP-8. Fort Collins, CO, USA.

Skaggs, R. 2008. Ecosystem services and western U.S. rangelands. Choices, 23(2):37–41.Smith, N., R. Deal, J. Kline, D. Blahna, T. Patterson, T.A. Spies, K. Bennett. 2011. Ecosystem services as a framework for forest stewardship: Deschutes National Forest overview. Gen. Tech. Rep.PNW-GTR-852. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Portland, OR. 46 pp.

Torell, L.A., Fowler, J.M., Kincaid, M.E., & Hawkes, J.M. (1996). The Importance of Public Lands to Livestock Production in the U.S. Range Improvement Task Force Report #32. Las Cruces, NM: New Mexico State University. Available online: http://cahe.nmsu.edu/pubs/_ritf/report32.pdf

Uresk, D. 2010. Cattle Weights on USDA Forest Service Lands by State With Cow and Calf Forage Consumption. Society for Range Management, Rangelands. 4 pp.

Uresk, D. W., K. E. Severson and J. Javersak. 2015. Model for classification and monitoring green ash-ecological type in the northern Great Plains. Proc. of the South Dakota Academy of Science.

USDA, Forest Service. 1986. Custer National Forest Plan.

USDA, Forest Service. 1986. Gallatin National Forest Plan.

USDA, Forest Service, 2008. Washington Office, Director of Rangeland Management Letter to Western Watersheds Project. June 18, 2008. 4 pp.

USDA, National Agricultural Statistics Services (NASS), 2016. Data posted January 2016 online. https://www.nass.usda.gov/Charts_and_Maps/Grazing_Fees/gf_cc.php

USDI-BLM, 1998. A User Guide to Assessing Proper Functioning Condition and the Supporting Science for Lotic Areas. Technical Report 1737-15 1998. USDI – Bureau of Land Management. Denver, CO.126 p.

USDI-BLM, 2003. A User Guide to Assessing Proper Functioning Condition and the Supporting Science for Lentic Areas. Technical Report 1737-16 1999, revised 2003. USDI – Bureau of Land Management. Denver, CO.109 p.

Vincent, Carol Hardy. 6/19/2012. Grazing Fees: Overview and Issues. Congressional Research Service. http://fas.org/sgp/crs/misc/RS21232.pdf

Appendix A – Allotment Capability and Suitability

Capable rangelands produce forage or have inherent forage producing capabilities, and if accessible can be grazed on a sustained yield basis. Suitable areas are capable areas minus areas chosen to be unacceptable to graze to minimize conflicts with areas such as campgrounds, other developed recreation sites, research natural areas, fenced rights-of-way or other areas closed by decision. These suitable areas must also be accessible to a specific kind of animal and which can be grazed on a sustained yield basis without damage to the resource. The existing forest plans are supported by a grazing suitability analysis that was done in the mid-1980s. In addition, there have been various suitability analyses conducted on allotments that have been closed since then. Allotment specific capability and suitability analyses have been conducted on allotments with changed conditions resulting in decisions that have refined capability and suitability aspects relative to livestock use. Current allotments are deemed suitable for permitted grazing per current Forest Plans and suitability is validated during project level allotment analyses and decisions.

Primary, Secondary, and Transitory Rangelands

On mountainous or more rugged rangeland, cattle congregate on the more convenient gentle terrain such as valley bottoms, riparian and hardwood draw zones, and ridgetops. Primary rangelands are those areas suitable for grazing which livestock naturally prefer or will use first under management as it is readily accessible and has available water. About 658,000 acres (National Forest System lands within allotments) or 22 percent of the Custer Gallatin National Forest lands are considered primary rangeland.

Secondary rangelands have characteristics similar to primary rangeland, except they are seldom used because of limited accessibility and/or lack of water. Livestock use is normally minimal or nonexistent on secondary rangeland. About 38,100 acres (National Forest System lands within allotments) or about 1 percent of the Custer Gallatin National Forest are considered secondary rangeland within existing allotments.

There are about 3,800 acres (National Forest System lands within allotments) of transitory range created by recent wildfires or timber harvest or less than 1 percent of the Custer Gallatin National Forest. Transitory rangelands, as defined here, are areas near water and accessible to livestock where forage is temporarily created by events such as wildfire or activities such as timber harvest that temporarily open up closed-canopied forest conditions.

In addition, primary and secondary rangelands consisting of open canopied forest cover temporarily increases in forage production and provides opportunities for improved livestock distribution as a result of fire or timber harvest until such time that forested canopy cover increases over time. As an example, recent fires across the Ashland landscape burned about 76,439 acres of forested cover types (see Reid, 2017, Non-Forested Vegetation Report; Appendix A, Table A-1, Transitional Forest category), of which 3,472 acres were closed canopied forests pre-fire (Appendix A of this report, Table A-1, Transitory Range category) and the remaining 72,967 acres that were open canopied forests pre-fire are still considered primary and secondary rangeland, but with increased production.

A grazing capability model was used to approximate primary, secondary, and transitory rangelands, and areas that are not capable for grazing within current allotments. Table A-1 summarizes these classifications by district. Figure A-1 and Figure A-2 depict general locations of primary rangelands.

Table A-1. Capable rangeland acreage (National Forest System) within allotments by district[37]

Ranger District	Capable			Non-Capable	Total Allotment
	Primary	Transitory	Secondary		
Montane					
Hebgen Lake	5700		147	16244	22092
Bozeman	25683		850	84303	110836
Gardiner	7704	1	73	32013	39790
Yellowstone (former Livingston District)	25071	256	326	78192	103846
Yellowstone (former Big Timber District)	33769		291	95521	129582
Beartooth	42964		8474	66142	117580
Montane Subtotal	140891	257	10162	372415	523725
Pine Savanna					
Ashland	376945[38]	3472	22739	28450	431607
Sioux	148396	104	5229	8395	162124
Pine Savanna Subtotal	525347	3576	27968	40317	593731
Grand Total	666233	3833	38130	412732	1117456

[37] By ownership, Primary, Secondary, and Transitory Rangelands and lands not capable for grazing were modelled using GIS for each allotment pasture.
Primary Rangeland was based on distance to reliable water sources within one mile, on slopes < 35%, and VMAP vegetation cover types capable of producing forage (all except sparse veg and conifer types with canopy cover greater than 65%. The five "proximity to water" categories were modelled for primary rangeland for each pasture (expected use) buffering distance from water at 0 to 1/8 mile; 1/8 to ¼ mile; ¼ to ½ mile; ½ to ¾ mile; and ¾ to 1 mile. Because horses generally tend to stay outside of forested areas, unlike cattle, for Allotments primarily permitting horses (00721 Taylor Fk; 00722 Sage Cr; 00728 N Cinnamon; 00729 S. Cinnamon; and 00102 Big Timber), the same model was used with the following changed parameter: VMAP vegetation cover types capable of producing forage (all except sparse veg and conifer types with canopy cover >15%).
Secondary Rangeland was based on distance to reliable water sources greater than one mile, on slopes less than 35%, and VMAP cover types capable of producing forage (all except sparse veg and conifer types with canopy cover greater than 65%.
Transitory Rangelands were based on distance to reliable water sources within one mile, on slopes less than 35%, and VMAP conifer cover types with canopy cover greater than 65% that recently burned moderately to high severity shifting to a transitory forage base. Lands Not Capable for Grazing were based on VMAP sparse vegetation; roads (centerline 15 foot buffer), and all areas >35% slope.

[38] Information for Ashland on/off permit water source location and functionality were not available for ~8189 acres at the time of the GIS modelling. For purposes of this assessment, the associated NFS acres were assumed to be primary rangelands within 1/8 to ¼ mile of a water source to help approximate existing conditions.

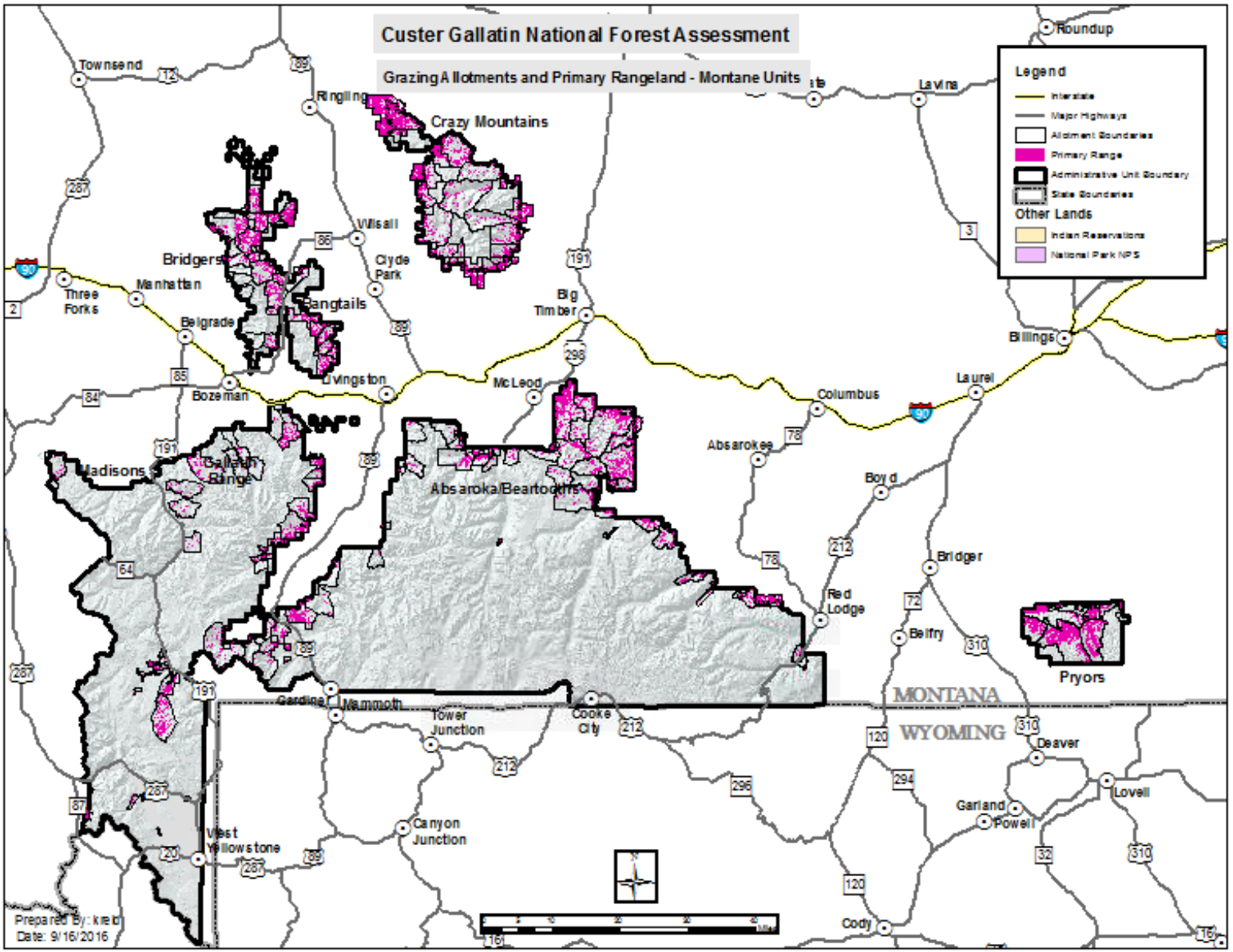

Figure A-1. Primary rangelands – montane units

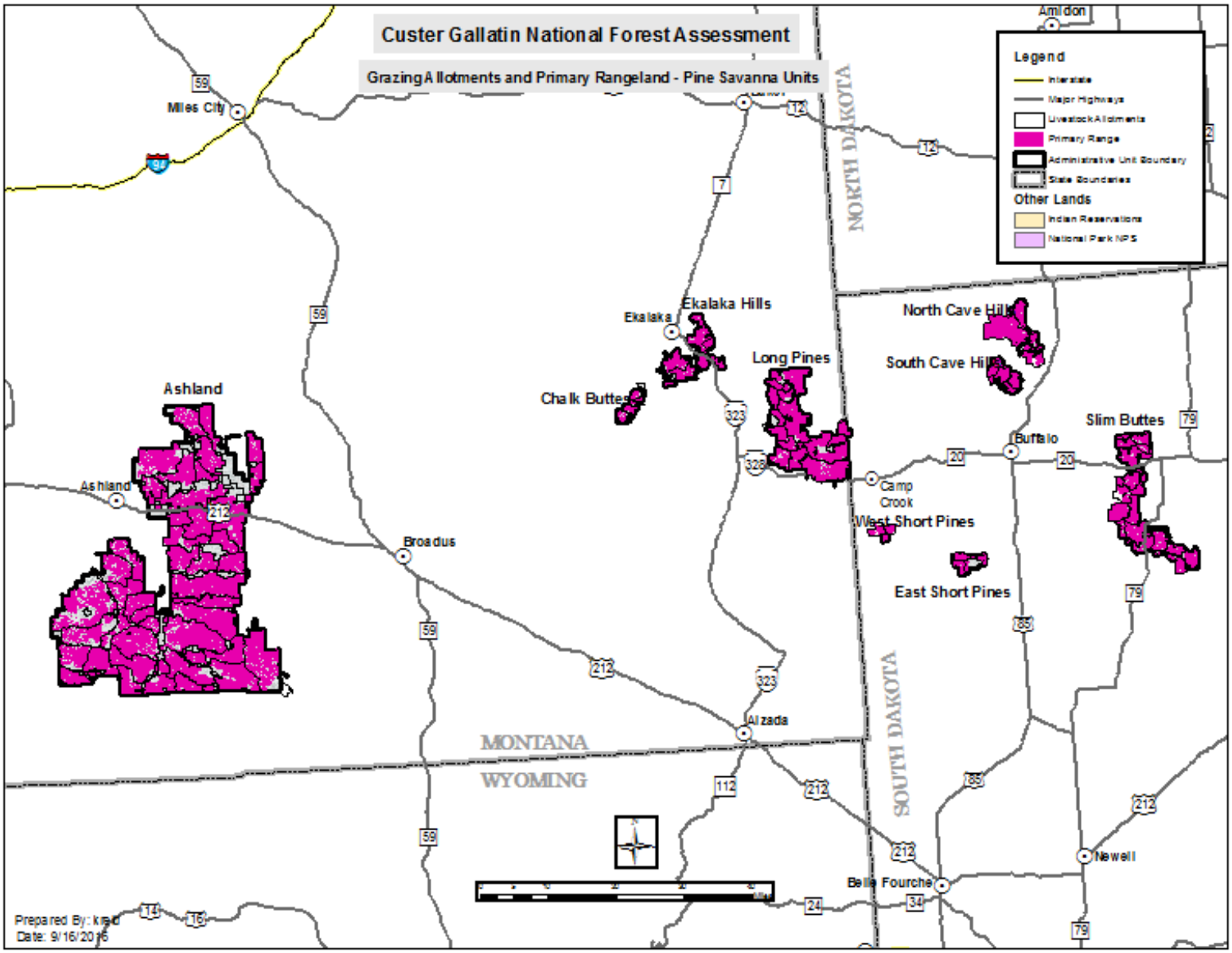

Figure A-2. Primary rangelands – pine savanna units

The following table displays primary rangeland by proximity to water. This provides context to amount of area where more or less grazing use is likely to occur as grazing levels tend to be less further from water. Even though about one third (36 percent) of the Custer Gallatin National Forest consists of livestock grazing allotments (22 percent of the montane units and 93 percent of the pine savanna units), only about a fifth or 22 percent of the Custer Gallatin National Forest consists of primary rangeland where livestock generally graze (6 percent of the montane units and 87 percent of the pine savanna units). Of the 22 percent primary rangelands, about 3 percent of the assessment area is within 1/8 mile of water where more concentrated use by livestock is likely to occur. Table displays allotment acreage, the acreage affected by livestock grazing in primary rangelands, and the percent of primary rangelands found with allotments and Custer Gallatin National Forest.

Table A-2. Primary rangeland (National Forest System) by proximity to water

District	District Acres (NFS)	Primary Acres by Proximity to Water					Acres Primary Rangeland & % of CGNF w/Primary Rangeland
		0 to 1/8 mile	1/8 to 1/4 mile	1/4 to 1/2 mile	1/2 to 3/4 mile	3/4 to 1 mile	
Montane							
Hebgen Lake	336820	2204	1354	1281	607	254	5700
Bozeman	422433	6645	6006	7622	3867	1543	25683
Gardiner	388066	1868	2032	2444	978	381	7704
Yellowstone	702503	16179	13904	19093	7361	2303	58840
Beartooth	588913	8929	9246	14002	7249	3537	42964
Montane Subtotal	2438735	35825	32543	44442	20064	8018	140891
% of Montane NFS		1%	1%	2%	1%	0%	6%
Montane % of CGNF							5%
Pine Savanna							
Sioux	164469	19409	31437	57612	28914	11025	148396
Ashland	436148	31925	78373[39]	151315	83387	31945	376945
Pine Savanna Subtotal	600617	51335	109810	208927	112301	42970	525342
% of Pine Savanna NFS		9%	18%	35%	19%	7%	87%
Pine Savanna % of CGNF							17%
Grand Total	3039352	87160	142353	253368	132365	50988	666233
Overall % of CGNF		3%	5%	8%	4%	2%	22%

[39] Information for Ashland on/off permit water source location and functionality were not available for ~8189 acres at the time of the GIS modelling. For purposes of this assessment, the associated NFS acres were assumed to be primary rangelands within 1/8 to ¼ mile of a water source to help approximate existing conditions.

Areas Not Capable for Grazing

Forage on steeper slopes over 60 percent receives little to no use by cattle while other slope classes receive various levels of use.[40] Local observations indicate that the majority of grazing occurs on slopes less than 35 percent. [41] In addition to slopes impeding use by livestock grazing, areas with little to no forage also determine where grazing is not likely to occur (for example, closed canopied conifer stands, roads, water bodies). Areas not considered for grazing capability model were based on little or no forage produced in the understory of closed canopy conifer stands greater than or equal to 65 percent canopy cover in combination of slopes greater than 35 percent with areas that have little to no forage (for example, closed canopied conifer stands, roads, water bodies).

[40] Holechek et. al., 1998 [Supporting Lit includes Glendening (1944), Mueggler (1965), Cook (1966), Gillen et. al (1984), Ganskopp and Vavra (1987) and Pinchak et. al (1991)].

[41] When field validating the grazing capability model, a 35% slope break was deemed an appropriate break to use based on field observations of livestock distribution.

Appendix B – Allotments and Riparian/Wetlands

This appendix describes allotment specific "proper functioning condition" inventories and long-term trend monitoring information related to riparian and wetland monitoring in primary rangelands of grazing allotments.

Currently, riparian vegetation within primary rangelands for permitted livestock grazing is approximately 3 percent of the riparian vegetation found in the montane units and 86 percent of the riparian vegetation found in the pine savanna units. Riparian vegetation within primary rangelands for permitted livestock grazing is approximately 5 percent of the riparian vegetation found in the overall assessment area as displayed in Table .

Table B-1. Amount of total National Forest System (NFS) primary rangeland and amount of riparian vegetation within primary rangeland vegetation

Landscape Area	NFS Primary Rangeland NFS Acres	Total NFS Acres	% of Total NFS that is Primary Rangeland	NFS Riparian Vegetation Acres	NFS Riparian Acres found within Primary Rangeland	% of NFS Riparian Vegetation that is in Primary Rangeland
Montane Units						
Madison, Henry's, Gallatin, Absaroka and Beartooth Mtns	73472	2158643	3%	5465	933	17%
Bridger, Bangtail, Crazy Mtns	40185	205025	20%	67695	1728	3%
Pryor Mtns	24383	75067	32%	2278	54	2%
Montane Subtotal	138040	2438735	6%	75438	2116	3%
Pine Savanna Units						
Ashland	376945	436148	86%	843	698	83%
Sioux	148396	164469	90%	1259	1119	89%
Pine Savanna Subtotal	525342	600617	87%	2102	1817	86%
Grand Total	666233	3039352	22%	77540	3933	5%

Proper Functioning Condition (PFC)

Riparian areas are functioning properly when adequate vegetation, land form, or woody material is present to dissipate stream energy during high flows, filter sediment, capture bedloads, aid in floodplain development, improve flood-water retention and ground water recharge, develop root masses that stabilize streambanks, and develop diverse characteristics which provide habitat to support greater biodiversity within their potential to achieve this condition (Prichard et al. 1998). By having these characteristics, a riparian area is resilient during floods (Prichard et al. 1998). This resiliency allows an area to provide desired values, such as fish habitat, neotropical bird habitat, or forage over time.

The functioning condition of riparian-wetland areas is a result of interaction among geology, soil, water, and vegetation. "Systems are Functioning properly when adequate vegetation, landform, or large woody debris is present to 1) dissipate stream energy associated with high waterflows, thereby reducing erosion and improving water quality, 2) filter sediment, capture bedload, and aid floodplain development, 3) improve flood-water retention and ground-water recharge, 4) develop root masses

that stabilize streambanks against cutting action, 5) develop diverse ponding and channel characteristics to provide the habitat and water depth, duration and temperature necessary for fish production, waterfowl breeding, and other uses, and 6) support greater biodiversity. Systems that are At-Risk are in a functional condition but an existing soil, water, or vegetation attribute makes them susceptible to degradation. Systems that are Non-Functioning, clearly are not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows and thus are not reducing erosion, improving water quality or protecting beneficial uses. The absence of certain physical attributes, such as a floodplain, where one should be, is an indicator of nonfunctioning conditions." (USDI Bureau of Land Management 1998).

Proper functioning condition is a methodology for assessing the physical functioning conditions of riparian areas and wetlands (USDI, 1998; USDI, 2003). Proper functioning condition defines a minimum level or starting point for assessing riparian areas and is the minimum riparian inventory method that the Forest Service is directed to do for riparian assessments (USDA Forest Service Chief's Memo, 1996, Adopting Proper Functioning Condition as a Minimum Standard for Riparian Assessments). Proper functioning condition is not the sole methodology for assessing the health of the aquatic or terrestrial components of a riparian area, nor is it a replacement for inventory or monitoring protocols designed to yield information on the biology of the plants and animals dependent on the riparian area. Proper functioning condition does not replace quantitative assessments or monitoring that may be needed to meet a variety of management needs. Proper functioning condition is not designed to address desired resource conditions and associated values, such as sensitivity rankings for special resource considerations such as watershed values, cultural values, or others. However, proper functioning condition is considered as the minimum starting requirement from which to work towards desired resource conditions and is a pre-requisite to achieving desired conditions (USDI, 1998. pp. 105-106 and USDI, 1999, p. 99).

This methodology is not used as a monitoring standard, but rather as a tool for prioritizing "at-risk" systems for restoration activities that can keep riparian areas from degrading or keep them from a non-functioning condition. Once a system is nonfunctional, the effort, cost, and time required for recovery is dramatically increased.

Proper functioning condition ratings considered clarification outlined for intermittent systems as described in USDA MT-99, *Using the Proper Functioning Condition Assessment Method for Intermittent and Ephemeral Streams.* Cooperative Riparian Restoration.

Riparian areas and hardwood stands are recognized ecologically as sometimes being geographically exclusive of each other and sometimes as being connected where a riparian area runs through a wooded draw. There are situations where an ephemeral drainage runs through a wooded draw. Proper functioning condition for lotic systems is not an appropriate methodology to use for ephemeral systems. However, proper functioning condition for lentic systems is an appropriate methodology for those riparian/wetland areas sporadically located along these ephemeral systems.

The condition of riparian areas was assessed as part of various livestock allotment assessments over the past 10 to 15 years. These assessments used proper functioning condition protocol to determine the condition (USDI Bureau of Land Management 1998, 2003). Habitat quality monitoring methodologies, such as proper functioning condition assessments, have been conducted where greatest needs have been identified. This helps to address site-specific issues, but it can bias any effort to determine trends in a larger geographic extent outside of primary rangelands used by permitted livestock.

The proper functioning condition process allows for independent evaluation of both lentic (standing water) and lotic (flowing water) systems. The process categorizes riparian systems into one of three condition classes: functioning, functioning at-risk and nonfunctioning. Journeyman level specialists made determinations in the field of riparian functionality. With their training in the proper functioning condition methodology, knowledge of stream types, and supplemented with their experience and knowledge of the local area hydrology, soils, and vegetation ecology, they conducted proper functioning condition assessments over the following areas[42]. Table summarizes field survey findings.

Table B-2. Inventoried riparian summary

	Proper Functioning Condition	Functional-At Risk			Nonfunctional			Grand Total # Surveys
Landscape Area	No Apparent Trend	Downward Trend	No Apparent Trend	Upward Trend	Downward Trend	No Apparent Trend	Upward Trend	
MONTANE UNITS								
Bridger, Bangtail, Crazy Mountains	16	1						17
Madison, Henry's, Gallatin, Absaroka and Beartooth Mountains	54	4	12	8	0	3	2	83
Pryor Mountains	96	1	31	0	0	2	0	130
Subtotal	166	6	43	8	0	5	2	230
PINE SAVANNA UNITS								
Ashland	8		7					15
Sioux	10		6					16
Subtotal	18	0	13	0	0	0	0	31
Grand Total	184	6	56	8	0	5	2	261

Within the primary rangelands permitted for grazing in the overall assessment area, 71 percent of the survey sites were found to be in proper functioning condition, with 27 percent functioning at risk and 2 percent were rated as non-functional. Within the montane units, 72 percent of the survey sites were found to be in proper functioning condition, with 25 percent functioning at risk and 3 percent were rated as non-functional. Within the pine savanna units, 58 percent of the survey sites were found to be in proper functioning condition, with 42 percent functioning at risk and none were rated as non-functional. Management decisions for addressing non-functional sites are typically through minor fencing or other applicable mitigated relative to grazing impacts. Management decisions for addressing the at risk sites generally involve a mix of grazing prescription changes such as reduced stocking rate, improved distribution techniques such as proper salting and off-site water development, reduced duration, and timing considerations. The at risk and non-functional sites are largely a function of legacy issues, including roads, uncharacteristic wildland fire, developed recreation, dispersed recreation, historically unmanaged grazing by livestock, and water development / diversion both on and off of National Forest System lands. Riparian areas can also be impacted by climate aspects such as drought. This is not to

[42] Some assessments were done by trained employees with review and any needed follow-up by journeyman level specialists.

discount that some areas still need further grazing management changes to address potential issues (i.e. due to long durations or season long-grazing).

Trends in riparian conditions are difficult to identify based on one site visit. Trends can generally be inferred, based on known changes in livestock management, or known disturbance events (i.e. "apparent trend"). Five percent of the riparian sites surveyed in the overall assessment area were considered to have a downward trend. In general, the trends for all riparian areas is up from a long-term perspective due to decreases in stocking rates over past decades, rest due to periodic non-use, and natural recovery from past wildfire events. However, the current trend for most reaches are considered not apparent.

Of 273 watershed condition framework-rated watersheds forestwide, 47 (17 percent) were functioning at risk, with the remainder rated as functioning properly. Of functioning at risk watersheds, 15 (32 percent) were on pine savanna districts and 32 (68 percent) were on the montane districts. To score as functioning at risk, a watershed required at least one watershed condition variable in non-functioning condition, in addition to several variables (typically 8 or 9) functioning at risk. None of the watersheds were rated as having impaired function. Fifty-six 6th-field watersheds were not rated since these watersheds have less than 5 percent of their area within the plan area. It should be noted that where no riparian areas exist within a watershed, a rating of good was assigned, unless the watershed is less than 5 percent on National Forest System lands. Given this information, 19 percent of the watersheds related to riparian indicators are rated as functioning at risk, with the remainder rated as functioning properly. Results are strikingly different for the pine savanna units, where 49 percent of watersheds had reduced riparian vegetation condition, compared to 6 percent of montane watersheds.

Journeyman level specialists whose credentials are sufficient to make proper determinations given their training in proper functioning condition, knowledge of stream types, and supplemented with their experience and knowledge of the local area hydrology, soils, and vegetation ecology conducted and/or reviewed proper functioning condition assessments made by other trained employees. Table details field survey findings.

Table B-3. Montane and pine savanna riparian functional condition surveys by allotment/area

Allotment Number or Area Description	Allotment / Area Name	Pasture Name / Reach Name	Proper Functioning Condition	Functional-At Risk			Nonfunctional			
			No Apparent Trend	Downward Trend	No Apparent Trend	Upward Trend	Downward Trend	No Apparent Trend	Upward Trend	Grand Total # Surveys
MONTANE UNITS										
Bridger, Bangtail, Crazy Mountains										
00106	CRAZY	CRAZY (DEVIL CR)		1						1
00127	SUNLIGHT	SWEETGRASS CR1	1							1
		SWEETGRASS CR2	1							1
00129	SWEET GRASS	SWEET GRASS CR	1							1
00213	HORSE CREEK	COTTONWOOD2	1							1
		COTTONWOOD3	1							1
00230	SOUTH FORK OF SHIELDS	SUNLIGHT CR	1							1
		DEEP CR	1							1
002XX	ROCK CREEK SOUTH	DONAHUE1	1							1
		DONAHUE2	1							1
		FISHER CR1	1							1
		FISHCER Cr2	1							1
		ROCK CR1	1							1
		ROCK CR2	1							1
		ROCK CR3	1							1
		STOUGHTEN CR	1							1
		UNK. REACH	1							1
	Subtotal		16	1						17

Allotment Number or Area Description	Allotment / Area Name	Pasture Name / Reach Name	Proper Functioning Condition	Functional-At Risk			Nonfunctional			
			No Apparent Trend	Downward Trend	No Apparent Trend	Upward Trend	Downward Trend	No Apparent Trend	Upward Trend	Grand Total # Surveys
Madison, Henrys Lake, Gallatin, Absaroka and Beartooth Mountains										
00103	BLIND BRIDGER	BLIND BRIDGER CREEK (1)	1							1
		BLIND BRIDGER CREEK (2)	1							1
		BRIDGER CR (1)	1							1
		BRIDGER CR (2)	1							1
00104	CAREY GULCH	BLIND BRIDGER CR GULCH	1							1
		CAREY GULCH	1							1
00107	DEER CREEK	BOX CANYON CR	1							1
		CHERRY CR (1)		1						1
		CHERRY CR (2)						1		1
		WEST FORK UPPER DEER CR							1	1
		WEST FORK UPPER DEER CR (1)	1							1
		WEST FORK UPPER DEER CR (2)				1				1
00112	GROUSE CREEK	SHEEP CREEK				1				1
00118	LODGEPOLE	EAST FORK UPPER DEER CR	1							1
00119	LOST CABIN CREEK	LOST CABIN CR	1							1
		ELK CR	1							1
00124	NURSES LAKE	GROUSE CR			1					1
		NURSES LAKE				1				1
00131	WEST BRIDGER	DERBY GULCH1	1							1

Allotment Number or Area Description	Allotment / Area Name	Pasture Name / Reach Name	Proper Functioning Condition	Functional-At Risk			Nonfunctional			
			No Apparent Trend	Downward Trend	No Apparent Trend	Upward Trend	Downward Trend	No Apparent Trend	Upward Trend	Grand Total # Surveys
		DERBY GULCH2	1							1
		LOWER DEER CR1	1							1
		LOWER DEER CR2	1							1
		NORTH DERBY GULCH1	1							1
		NORTH DERBY GULCH2	1							1
		TOMATOR CAN GULCH1	1							1
		TOMATO CAN GULCH2	1							1
		W BRIDGER CR1	1							1
		W BRIDGER CR2	1							1
		DERBY GULCH2			1					1
		JIM'S GULCH			1					1
		LOWER DEER CR				1				1
		NORTH DERBY GULCH 1				1				1
		NORTH DERBY GULCH2						1		1
		NORTH DERBY GULCH 3			1					1
		TIE CUTTER GULCH	1							1
		WEST BRIDGER CR	1							1
00135	WEST FORK DEER CREEK	CASTLE ENOS							1	1
		CHERRY		1						1

Allotment Number or Area Description	Allotment / Area Name	Pasture Name / Reach Name	Proper Functioning Condition	Functional-At Risk			Nonfunctional			
			No Apparent Trend	Downward Trend	No Apparent Trend	Upward Trend	Downward Trend	No Apparent Trend	Upward Trend	Grand Total # Surveys
00209	EIGHTMILE CREEK	EIGHTMILE CR	1							1
00317	SLIP AND SLIDE	SLIP AND SLIDE CR			1					1
		UNK REACH	1							1
00319	WIGWAM	TEEPEE CREEK			1					1
Gardiner	Bison Tolerance Zone	Bassett Cr	1							1
		Bear Cr	1							1
		Cedar Cr1	1							1
		Cedar Cr2	1							1
		Davis Cr	1							1
		Eagle Cr	1							1
		Little Trail Cr	1							1
		Big Spring Cr	1							1
		Little Spring Cr	1							1
00724	WAPITI	WAPATI CR	1							1
20831	BAD CANYON	TROUT CREEK RIPARIAN			1					1
		TROUT CREEK RIPARIAN				1				1
		WILDCAT				1				1
20862	SHEEP CREEK	BLIND SHEEP				1				1
		MAIN SHEEP		1						1
		MAIN SHEEP	1							1
20837	BURNT FORK	NORTHEAST	1							1
		NORTHWEST	1							1
		SOUTH			1					1
20838	BUTCHER CREEK	BUTCHER CREEK	1							1

Allotment Number or Area Description	Allotment / Area Name	Pasture Name / Reach Name	Proper Functioning Condition	Functional-At Risk			Nonfunctional			
			No Apparent Trend	Downward Trend	No Apparent Trend	Upward Trend	Downward Trend	No Apparent Trend	Upward Trend	Grand Total # Surveys
20842	EAST ROSEBUD	EAST ROSEBUD			1					1
20848	HOGAN CREEK	BURNT FLAT	1							1
		HOGAN CREEK			1					1
20852	LODGEPOLE	EAST			1					1
		WEST	1							1
20855	MEYERS CREEK ADMIN SITE	SOUTH HAYFIELD	1							1
20856	BLACK BUTTE ADM SITE	BLACK BUTTE ADMIN. SITE	1							1
20858	PASS CREEK	CASTLE CREEK	1							1
		MEYERS CREEK			1					1
		PASS CREEK ON/OFF	1							1
		QUAKER/RUSSELL						1		1
20859	PICKET PIN	EAST	1							1
		WEST	1							1
20861	ROCK CREEK	HAYWOOD	1							1
		MAURICE	1							1
		SEELEY	1							1
		WOODS	1							1
20862	SHEEP CREEK	MAIN SHEEP	1							1
20871	WEST ROSEBUD	EAST SHOREY		1						1
		GRAVEL PIT #1	1							1
		WEST ROSEBUD	1							1
	Subtotal		54	4	12	8	0	3	2	83

Allotment Number or Area Description	Allotment / Area Name	Pasture Name / Reach Name	Proper Functioning Condition	Functional-At Risk			Nonfunctional			
			No Apparent Trend	Downward Trend	No Apparent Trend	Upward Trend	Downward Trend	No Apparent Trend	Upward Trend	Grand Total # Surveys
Pryor Mountains										
20869	WELLS	WELLS		1						1
20872	SAGE CREEK CAMPGROUND	SAGE CREEK CAMPGROUND	1							1
20873	SAGE CREEK CLOSED	KIRK CLOSED	1							1
		NORTH SCHWEND CLOSED			1					1
		RED BUTTE / S FORK SAGE CLOSED						1		1
		SAGE CREEK BNDY CLOSED			1					1
20874	SAGE CREEK	HARSTEN			1					1
		HOWE	1							1
		SMITH / ROBERTS BENCH			1					1
		SOUTH SCHWEND			1					1
		UPPER SAGE			1					1
20875	RED BUTTE	NORTH FORK						1		1
Big Pryor Wshed	Plot 55	Piney Creek	1							1
	56	Bainbridge (Basin) Spring	1							1
	57	Ingram Spring			1					1
	58	Rimrock Spring			1					1
	59	Big Pryor 2 Stringer Meadows			1					1

Allotment Number or Area Description	Allotment / Area Name	Pasture Name / Reach Name	Proper Functioning Condition	Functional-At Risk			Nonfunctional			
			No Apparent Trend	Downward Trend	No Apparent Trend	Upward Trend	Downward Trend	No Apparent Trend	Upward Trend	Grand Total # Surveys
	60	Big Pryor 2 Camp Unit 1	1							1
	61	Seep Spring (Ramis 000265)	1							1
	62	Prospector (Graham) Spr (Ramis 000262)	1							1
	62a	N Graham Spring	1							1
	R50, 51, 52, 53, 54	Dry Washes: Lower Bent Trail; Timber Canyon; Water Canyon; Inferno Canyon; Bear Canyon – N0 Rating								0
	R55	Bear Spring			1					1
	R56	Lower Ingram			1					1
	R57	Big Pryor N Pasture	1							1
	R58	N of Angus Spring			1					1
	R59	Big Pryor 2 Seep in Upper Meadow			1					1
	R60	Big Pryor 2 Seep in long meadow			1					1
	R61	N of Big Pryor 2 Long Meadow	1							1
	R62	N of Big Pryor 2 Long Meadow	1							1
	R63	N of Big Pryor 2 Long Meadow	1							1
	R64	3 Springs NW Bainbridge	1							1

Allotment Number or Area Description	Allotment / Area Name	Pasture Name / Reach Name	Proper Functioning Condition	Functional-At Risk			Nonfunctional			
			No Apparent Trend	Downward Trend	No Apparent Trend	Upward Trend	Downward Trend	No Apparent Trend	Upward Trend	Grand Total # Surveys
	R65	Big Pryor 2 Large Meadow	1							1
	R66	Big Spring (Ramis 000238)	1							1
	R66a	E Seep Spring	1							1
	R67	E Bainbridge	1							1
	R68	Sheep Res (Ramis 000258)	1							1
	R69	Burnt Ridge Spring (Ramis 000264)	1							1
	R70	Midway Spring (Ramis 000237)	1							1
	R71	Seep below Loyning Camp	1							1
	R72	W Loyning Camp			1					1
	R73	Bear Canyon Spring			1					1
	R74	W Fk Bear Canyon	1							1
	R75	W N Fk Bear Canyon	1							1
	R76	W N Fk Bear Canyon	1							1
	R77	E of W Fk Bear Canyon	1							1
	R78	W Fk Bear Canyon	1							1
	R79	SE of W Fk Bear Canyon	1							1
	R80	Purvis Cabin Spring	1							1
	R81	E of W Fk Bear Canyon	1							1

Allotment Number or Area Description	Allotment / Area Name	Pasture Name / Reach Name	Proper Functioning Condition	Functional-At Risk			Nonfunctional			
			No Apparent Trend	Downward Trend	No Apparent Trend	Upward Trend	Downward Trend	No Apparent Trend	Upward Trend	Grand Total # Surveys
	R83	King Spring	1							1
	R84	W Loyning Camp	1							1
	R85	E Loyning Camp	1							1
	R85a	Below E Loyning Camp	1							1
	R86	Sp W of Purvis/Elk	1							1
	R87	Purvis (Elk) Spring (Ramis 000239)			1					1
	R88	3 Below Sp (Ramis 000312)	1							1
	R89	Murdi Sp (Ramis 000308)	1							1
	R89a	Murdi	1							1
	R90	Red Pryor Spr (Ramis 000307)			1					1
	R91	Bainbridge Cabin Seeps	1							1
	R92	Bainbridge Cabin Spr	1							1
Crooked Cr Wshed	16	Crooked Creek Head Exclosure			1					1
	24	Crooked Creek Head	1							1
	25	Crooked Creek Head	1							1
	26	Crooked Creek E Trib	1							1
	27	Crooked Creek	1							1
	28	Crooked Creek	1							1

Allotment Number or Area Description	Allotment / Area Name	Pasture Name / Reach Name	Proper Functioning Condition	Functional-At Risk			Nonfunctional			
			No Apparent Trend	Downward Trend	No Apparent Trend	Upward Trend	Downward Trend	No Apparent Trend	Upward Trend	Grand Total # Surveys
	29	Tibbs Hollow	1							1
	30	Upper Wyoming Creek	1							1
	31	Upper Wyoming Creek S Fk	1							1
	32	Lower Wyoming Creek	1							1
	36	Mill Hollow			1					1
	37	Bridge Hollow	1							1
	38	Commissary Creek	1							1
	39	Commissary Creek			1					1
	40	Crooked Creek Head	1							1
	41	N of N Comm Fence	1							1
	42	Commissary Ridge	1							1
	43	Lost Jack Spring below tank	1							1
	44	N Lost Jack			1					1
	45	Upper Commissary Ridge	1							1
	R11	Upper Tibbs	1							1
	R12	N Fk Wyoming Creek	1							1
	R12a	Crooked Creek	1							1
	R22	Lower MIll Hollow	1							1
	R23	Gooseberry Hollow	1							1
	R24	Crooked Creek below Gooseberry	1							1

Allotment Number or Area Description	Allotment / Area Name	Pasture Name / Reach Name	Proper Functioning Condition	Functional-At Risk			Nonfunctional			
			No Apparent Trend	Downward Trend	No Apparent Trend	Upward Trend	Downward Trend	No Apparent Trend	Upward Trend	Grand Total # Surveys
	R25	Crooked Creek below Gooseberry	1							1
	R26	Gooseberry Hollow below road	1							1
	R27	Crooked Creek near Lost Water Canyon	1							1
	R29	Dry Channel; Cave Creek; no rating								0
	R30	Island Creek Headwaters	1							1
	R31	Dry Wash: Lower Cave Creek below R29; no rating								0
	R32	Seeps above Crooked Creek	1							1
	R33	Seeps above Crooked Creek	1							1
	R34	Spring above Lost Jack	1							1
	R35	Crooked Creek Trib	1							1
	R36	Crooked Creek Trib	1							1
	R37	Crooked Creek Trib above road	1							1
	R7	E Fk Crooked Creek	1							1
	R8	Crooked Creek	1							1
	R9	Crooked Creek	1							1
Dryhead / Punchbowl Wshed	33	E Fk Dry Head			1					1
	34	E Fk Dry Head	1							1

Allotment Number or Area Description	Allotment / Area Name	Pasture Name / Reach Name	Proper Functioning Condition	Functional-At Risk			Nonfunctional			
			No Apparent Trend	Downward Trend	No Apparent Trend	Upward Trend	Downward Trend	No Apparent Trend	Upward Trend	Grand Total # Surveys
	35	E Fk Dry Head			1					1
	46	Dry Head Creek below Harsten	1							1
	47	Dry Head Creek below 46	1							1
	48	N Fk Dry Head Creek Trib			1					1
	49	N Fk Dry Head Creek below 48	1							1
	50	N Fk Dry Head Creek	1							1
	52	N Fk Dry Head Creek	1							1
	53	Punch Bowl Head			1					1
	54	N Fk Dry Head Creek?			1					1
	R15	Dry Head above 34	1							1
	R16	E Side Dry Head Allotment	1							1
	R17	Above E Dry Head Allotment			1					1
	R18	Dry Head Bench			1					1
	R19	Dry Head Seep			1					1
	R20	Dry Head Bench	1							1
	R20a	Dryhead bench in conifers	1							1
	R21	Dry Head NE Spring	1							1
	R38	E Fk Dry Head	1							1
	R39	N Fk Dry Head	1							1

Allotment Number or Area Description	Allotment / Area Name	Pasture Name / Reach Name	Proper Functioning Condition	Functional-At Risk			Nonfunctional			
			No Apparent Trend	Downward Trend	No Apparent Trend	Upward Trend	Downward Trend	No Apparent Trend	Upward Trend	Grand Total # Surveys
	R39A	N Fk Dry Head	1							1
	R40	N of N Fk Dry Head			1					1
	R40a	N Fk Dry Head Confluence	1							1
	R40b	N Fk Dry Head	1							1
	R42	Punch Bowl - below Nick Point	1							1
	R43	Punch Bowl Confluence	1							1
	R44	Punch Bowl	1							1
	R45	E Wells Draw - exclosure	1							1
	R46	Lower Beaver Slide	1							1
	Subtotal		96	1	31	0	0	2	0	130
MONTANE SUBTOTAL			166	6	43	8	0	5	2	230
PINE SAVANNA UNITS										
Ashland										
	TAYLOR CREEK	WOLF DEN SP	1							1
		PETRIFIED LOG SP	1							1
	INDIAN CREEK	SPRING UNIT	1							1
		LOWER SPRING UNIT	1							1
		TAYLOR CREEK	1							1
	EAST TOOLEY	BEAR CREEK	1							1
	TIMBER CREEK	East Fork Hanging Woman Creek – Davis Prong			1					1

Allotment Number or Area Description	Allotment / Area Name	Pasture Name / Reach Name	Proper Functioning Condition	Functional-At Risk			Nonfunctional			
			No Apparent Trend	Downward Trend	No Apparent Trend	Upward Trend	Downward Trend	No Apparent Trend	Upward Trend	Grand Total # Surveys
		STOCKER BRANCH			1					1
40683	COW CREEK	EAST			1					1
		WEST			1					1
		Horse Cr – Trib1 Lower			1					
		Horse Cr – Trib1 Upper			1					
		Horse Cr – Trib South	1							
		Horse Cr - Upper			1					
	HOME CREEK	Home Creek	1							1
	Subtotal		8		7					15
Sioux										
30772	SD[43] -NCH - Davis Draw	Davis Draw DD1	1							1
30808	SD -NCH - Pelham_Julberg	Pelham_Julberg PJ1	1							1
30813	SD -NCH - Schleichart	Three Mine Ponds SD1	1							1
		Meadows Below Mine Ponds SD2	1							1
		Schleichart Reservoir SD3	1							1

[43] SD = South Dakota. Sioux District land units in South Dakota are North Cave Hills (NCH); South Cave Hills (SCH), Slim Buttes (SB), East Short Pines (ESP), and West Short Pines (WSP)

Allotment Number or Area Description	Allotment / Area Name	Pasture Name / Reach Name	Proper Functioning Condition	Functional-At Risk			Nonfunctional			
			No Apparent Trend	Downward Trend	No Apparent Trend	Upward Trend	Downward Trend	No Apparent Trend	Upward Trend	Grand Total # Surveys
		Below Schleichart Reservoir SD4	1							1
30784	SD - SCH - JA Clarkson	Upper Dry Creek JAC1	1							1
		Lower Dry Creek JAC2	1							1
		Near E Clarkson Well JAC3			1					1
30759	SD - ESP - Box Springs No. 3	Box Springs No. 3 BS1	1							1
30765	MT[44] - LP - Carter	Trib to S. Slick Creek-Ward Spring LP03			1					1
		Unnamed trib to S.Slick Creek LP07			1					1
		Upper Speelmon-SE trib LP05			1					1
		Upper Speelmon-Ballinger Spring LP06	1							1
30774	MT - LP - Devils Cr-Neece	Upper Iron Spring Creek LP09			1					1
30789	MT - LP - Kennedy	Lower iron Spring Creek LP10			1					1
	Subtotal		10		6					16
PINE SAVANNA SUBTOTAL			18		13					31
GRAND TOTAL			184	6	56	8	0	5	2	261

[44] MT = Montana. Sioux District land units in Montana are Long Pines (LP), Ekalaka Hills (EH), and Chalk Buttes (CB)

Riparian Long-Term Trend Monitoring - Montane

At a finer scale within the primary rangelands in allotments on the Montane units, riparian inventory and monitoring have been conducted in preparation for allotment management analysis by interdisciplinary teams (about 90 percent of the allotments have been conducted) and for effectiveness monitoring. Following the Custer Gallatin National Forest riparian monitoring framework and protocols, riparian vegetation indicators have been measured in 32 stream reaches in the montane units of the Custer Gallatin National Forest. Each stream reach macroplot provides vegetation composition and ground cover summary statistics for all quadrats sampled along the greenline and within cross-sections (n=72). The greenline quadrats provides vegetation composition and ground cover summary statistics for 42 quadrats (21 along each streambank), along the first line of perennial vegetation nearest to the water's edge. The cross-section quadrats provide vegetation composition and ground cover summary statistics for quadrats placed at 3, 6, and 9-meter intervals from the greenline, and along 10 transects (5 on each side of the stream) perpendicular to the direction of the valley bottom (n=30).

For this assessment, the data have been aggregated up as a summary of averages and ranges of the stream reach data to give an approximation of conditions within grazing allotment primary rangelands within montane units of the assessment area[45]. The aggregated averages and ranges of data are summarized by the greenline area only, the cross-section area only and the entire reach in Table

Table B-4. Measurements of riparian vegetation ecosystem indicators on the Custer Gallatin National Forest montane units

Riparian Vegetation Ecosystem Indicators	Greenline Average (Range)	Cross Section Average (Range)	Reach Greenline and Cross Section Average (Range)
Species Richness (Species Count)	62 (25-86)	65 (37-99)	84 (45-112)
Wetland Prevalence Index	2.7 (1.7-3.7)	3.2 (1.8-3.9)	2.9 (2.0-3.7)
Relative Frequency Hydric Species (%):	30 (9-50)	12 (1-30)	23 (7-35)
Relative Frequency Mesic Species (%):	37 (19-48)	48 (19-56)	39 (19-50)
Relative Frequency Upland Species (%):	29 (9-56)	41 (18-71)	34 (13-62)
Relative Cover Hydric Species (%):	41 (8-82)	18 (Trace-74)	33 (6-79)
Relative Cover Mesic Species (%):	29 (8-48)	36 (15-66)	31 (10-49)
Relative Cover Upland Species (%):	25 (3-63)	41 (3-77)	32 (3-68)
Relative Frequency Native Species (%):	74 (51-98)	71 (51-89)	74 (52-90)
Relative Frequency Introduced Species (%):	22 (2-42)	25 (10-46)	23 (10-39)
Relative Frequency Noxious Species (%):	1 (Trace-6)	3 (Trace-11)	2 (Trace-8)
Relative Cover Native Species (%):	82 (59-100)	77 (37-93)	80 (53-96)
Relative Cover Introduced Species (%):	15 (Trace-41)	20 (3-63)	17 (4-47)
Relative Cover Noxious Species (%):	1 (Trace-3)	2 (0-9)	1 (0-4)

[45] Specific reach reports and baseline data are located at the Supervisor's Office. These reports are reach specific and multiple indicators were assessed relative to the site's ecological potential, which is related to valley width and gradient, stream type and local precipitation.

Species Richness

Findings. There were a total of 404 species found within the greenline, 428 within the cross section survey areas, with 484 species in the reach's combined area. Within the green line the number of plant species within surveyed stream reaches ranged from 25 to 86, averaging 62 species per reach. Within the cross section the number of plant species ranged from 37 to 99, averaging 65 species. Within the reach's combined area the number of plant species ranged from 45 to 112, averaging 84 species.

Wetland Prevalence Index

In general, it is desirable for riparian areas to have lower relative frequency and cover of upland species and higher relative frequency and cover of hydric and mesic species, as this indicates maintenance of soil moisture characteristics and hydrologic regime. The wetland prevalence index is calculated by multiplying the relative cover with a wetland indicator value[46] for each species and summing the species' scores to arrive at the index. An index value less than 3 indicates that the site is dominated by hydrophytic vegetation. A value above 3 indicates that the site is dominated by drier site vegetation. The wetland prevalence index may also be used to detect long-term trend in riparian condition, especially when assessing the greenline and reach macroplots.[47]

Findings. Of the most recent surveys, an average index value of 2.72 was found indicating hydrophytic vegetation along the greenline overall. Five greenline surveys had an index value of over 3 indicating drier vegetation. The index values per reach surveyed ranged from 1.73 to 3.67.

Relative Cover and Frequency by Functional Group

Cover and Frequency. Canopy cover and, to a lesser degree, frequency are two measures of abundance used to describe the composition and distribution of vegetation species at the quadrat and macroplot level. The sum of canopy cover values can exceed 100 percent for a quadrat because of overlap or layering among species (due to varying heights of species). Relative cover and frequency is the cover or frequency of a particular species as a percentage of total plant cover or frequency. Relative cover or relative frequency will always tally up to 100 percent.

Functional Groups. The health of a riparian ecosystem is influenced by the functional characteristics of the vegetation present.

The hydric (hydrophytic) functional group have root masses capable of withstanding high flow events and protecting streambanks from erosion. The presence of hydrophytic species also indicates maintenance of soil moisture characteristics associated wetland and moist riparian conditions. A large proportion of hydrophytic species cover relative to mesic and upland species indicates desirable riparian conditions.

The mesic functional group contains plant species that are often found in the transitional zone between hydric and upland habitat conditions. Mesic species are adapted to moderately moist habitats and generally have root masses capable of withstanding moderate flow events. The proportion of mesic species may be used to detect trend in riparian conditions; a shift from more hydric to more mesic cover

[46] Wetland Indicator Values are assigned to each species. They are: 1 – Obligate; 2 - Facultative Wet; 3 - Facultative ; 4 - Facultative Upland; 5 (Coles-Ritchie, 2007)

[47] The wetland prevalence index may be of less value when evaluating cross-section and reach macroplots if the site is located in a narrow valley with steep side-slopes. In this circumstance, cross-section quadrats may be located in the adjacent upland vegetation community as a function of height above water table and/or distance from the greenline, resulting in a higher wetland prevalence index value. A positive trend in riparian conditions would be demonstrated by a significant decrease in the wetland prevalence index value over time.

may indicate a decline in riparian conditions, as it may signal a shift to drier soil characteristics and a lowering of the water table.

The upland functional group has mostly upland (non-riparian) species with typically shallower, less dense root masses, susceptible to scouring by the erosive force of the stream channel, which may lead to unstable channel conditions. An increase in the relative cover of upland plants in a riparian area indicates declining riparian conditions and increased sensitivity to disturbance. Review of weather patterns (e.g., drought years), current and historical management activities and disturbances is necessary to properly determine if the source of a decline in relative frequency and cover is attributable to livestock management.

Cover. Canopy cover is thought to be more ecologically significant than frequency because it is a measure of abundance, and therefore an indirect indicator of how much a plant dominates/influences a plant community. However, canopy cover is also influenced by fluctuations in annual precipitation and temperature, thus consideration should be given to annual weather patterns (i.e., a drought year or multiple drought years) when determining existing condition and apparent trends of riparian vegetation.

Frequency. Frequency describes the proportion of quadrats within a macroplot in which a species is present. A large plant species can have high average canopy cover, but occur in few quadrats in a macroplot, resulting in low frequency. Similarly, small stature species such as grasses, that have associated low cover, can occur in a high proportion of quadrats sampled, thus having high frequency. Frequency is less sensitive than cover to fluctuations in climatic conditions and consequently a more accurate trend predictor.

Higher relative frequencies for hydric and mesic functional groups indicate more desirable riparian conditions. Hydric and mesic species are adapted to moist and moderately moist soil conditions, indicating maintenance of soil moisture characteristics associated with healthy riparian conditions. Hydric and mesic species also have root masses capable of withstanding higher flow events and protecting streambanks.

Upland plant species do not typically have root masses capable of stabilizing streambanks and resisting the energies of the stream. Therefore, riparian areas with high relative frequency of upland plant species are more vulnerable to disturbance and indicative of compromised conditions when found within the greenline. A high relative frequency of upland plant species may indicate the riparian area is losing, or has lost contact with the water table.

Findings. Along the greenline relative frequency of hydric species averaged 30 percent, mesic species averaged 37 percent and upland species averaged 29 percent. Along the greenline transects, relative cover of hydric species averaged 41 percent, mesic species averaged 29 percent and upland species averaged 25 percent.

Along the cross section, relative frequency of hydric species averaged 30 percent, mesic species averaged 37 percent, and upland species averaged 29 percent. Along the cross section transects, relative cover of hydric species averaged 41 percent, mesic species averaged 29 percent and upland species averaged 25 percent.

Relative Frequency and Cover by Native and Noxious Status

High relative frequency and cover of introduced and noxious species combined is a strong indicator of a degraded riparian ecosystem. Lower values may indicate the potential for the structure and function of

the system to become degraded in the future. If introduced and noxious plant species are not managed to favor native riparian species, the riparian area may become more vulnerable to disturbance.

Findings. Along the greenline, native species' relative frequency averaged 74 percent and relative cover averaged 82 percent; introduced species' relative frequency averaged 22 percent and relative cover averaged 15 percent. Noxious weeds averaged 1 percent along the greenline. Along the greenline transects, Canada thistle was found in 23 reaches, houndstongue was found in 10, oxeye daisy was found in one and tall buttercup was found in one reach.

Along the cross section, native species' relative frequency averaged 71 percent and relative cover averaged 77 percent introduced species' relative frequency averaged 25 percent and relative cover averaged 20 percent. Noxious weeds averaged 1 percent within the cross section. Along the cross-section, Canada thistle was found in 20 reaches, houndstongue was found in 17, oxeye daisy was found in one and tall buttercup was found in one reach.

Streambank Stability

Stable streambanks indicate a stream is maintaining its energy and sediment balances – retaining the stream's pattern and profile, reducing excessive sediment delivery, and providing cover for aquatic organisms, particularly where undercut banks form. These attributes are evaluated as part of watershed condition framework for the Forest's watersheds, and quantified at PacFish/InFish biological opinion monitoring reaches where both streambank stability and undercut banks were measured (Archer and Ojala 2016a, 2016b). Undercut banks are particularly indicative of riparian vegetation conditions, because roots of riparian graminoids and woody vegetation provide the structural support that allows these banks to develop.

The watershed condition framework ratings indicate that streambank attributes, evaluated as part of the larger category of stream channel shape and function, were localized issues for montane streams. Conversely, about 60 percent of pine savanna watersheds were rated as functioning at risk for this attribute. Not all of this rating is result of riparian conditions – some is a result of localized impacts of stock dams and water diversions on stream channels – but riparian conditions are the primary driver.

Data from the PacFish/InFish biological opinion indicate that, although the range of streambank conditions is similar between montane managed and reference streams, there are more streams with reduced undercut banks in managed watersheds (Archer and Ojala 2016a). This overall pattern is a likely result of legacy land management (Barndt and Chaffin 2016) and will be addressed in more detail in the large woody debris discussion. For pine savanna units, the small number of PacFish/InFish biological opinion sites and lack of reference sites limits inference, but streambank condition variables are stable at measured sites (Archer and Ojala 2016b).

Woody Species Age Classes

Shrubs are essential for stabilizing certain stream types, and certain riparian plant communities. Where present, woody species act as a barrier to livestock and wildlife, provide fish cover and help prevent streambanks from being trampled or eroded by animals trailing along the banks. Maintaining woody species for streambank protection is often the most efficient way to protect streams from degradation. Trees and shrubs can be managed to reduce animal access to streambanks. Relatively dense stands of willow, alder, or other species along the stream channel will protect the streambanks from animal trampling, and also provide winter and summer shelter and cover. Livestock and wildlife use of woody browse can be a significant factor when trying to maintain or restore woody vegetation.

Integrated riparian and channel morphology monitoring has been conducted on livestock grazing allotments over the past several years using Custer Gallatin riparian protocols for the montane units. Of 114 surveys with tree and shrub life forms, the mix of age classes, as shown in the following table, is diverse. It was found that on average 85 percent of the tree and shrub species were in seedling and sapling age classes that are needed for recruitment and maintenance of woody species in the systems.

Table B-5. Age class summary of tree and shrubs in inventoried montane riparian

Tree and Shrub Life Form Age Class	# of Trees Inventoried	Age Class Percent
pole/mature	95	16%
saplings	181	30%
seedlings	333	55%
Grand Total	609	100%

Table B-6. Age class by tree and shrub lifeform

Tree and Shrub Life Form Age Class	# of Trees Inventoried	Age Class Percent
Tree Life Form		
pole/mature	95	18%
Douglas-fir	16	3%
Engelmann spruce	18	3%
lodgepole pine	6	1%
quaking aspen	38	7%
subalpine fir	7	1%
whitebark pine	10	2%
saplings	175	34%
Douglas-fir	14	3%
Engelmann spruce	18	3%
lodgepole pine	7	1%
ponderosa pine	1	0%
quaking aspen	119	23%
Rocky Mountain juniper	1	0%
subalpine fir	14	3%
whitebark pine	1	0%
seedlings	247	48%
black cottonwood	30	6%
Douglas-fir	45	9%
Engelmann spruce	27	5%
lodgepole pine	6	1%
ponderosa pine	16	3%
quaking aspen	113	22%
subalpine fir	10	2%
Tree Subtotal	517	100%
Shrub Life Form		
saplings	6	7%

Tree and Shrub Life Form Age Class	# of Trees Inventoried	Age Class Percent
chokecherry	4	4%
water birch	2	2%
seedlings	86	93%
chokecherry	85	92%
water birch	1	1%
Shrub Subtotal	92	100%
Grand Total for Tree and Shrub Life Forms	609	100%

Appendix C – Allotments and Green Ash Woodlands

Overview

Green ash woodlands within the assessment area fall under the green ash/chokecherry habitat type (*Fraxinus pennsylvanica/Prunus virginiana*) is a prominent type in the Great Plains region. Most of the Ashland and Sioux Districts are primary rangelands within allotments permitted for livestock use and include this unique green ash woodland component. About 8,260 National Forest System acres occur on the Sioux District and about 670 acres occur on the Ashland District. This appendix describes methods used to inventory the condition of green ash woodlands during allotment analyses and the results. For more detailed information about this community and overall trends, see the "Terrestrial Ecosystems – Non-Forested Vegetation" report (Reid, 2017).

Examples of undisturbed and disturbed green ash stands have been characterized. Girard (1989) and Hanson and Hoffman (1988) described a late successional undisturbed green ash/chokecherry community for the green ash/chokecherry habitat type. The characteristics of this community best correspond to the desired condition for meeting the Forest Plan goal of providing for healthy self-perpetuating plant communities with optimum diversity and density of understory vegetation.

Undisturbed green ash stands are typically characterized by three layers of woody vegetation: a closed canopy overstory layer dominated by green ash, a middle layer composed of tall shrubs and green ash saplings, and a lower layer mid and low shrubs, and herbaceous vegetation layer (Girard et al. 1989, Hanson and Hoffman 1988).

This contrasts with disturbed stands, which are typically woodlands with an open overstory (less than 69 percent tree foliar cover) and a single understory layer of low shrubs and herbaceous vegetation dominated by snowberry and Kentucky bluegrass. The abundance of chokecherry (*Prunus virginiana*) is also reduced in disturbed communities. The middle layer of tall shrubs and green ash saplings is often missing (Hanson and Hoffman 1988). In disturbed occurrences, the understory is a dense shrub layer of western snowberry (*Symphoricarpos occidentalis*). In less disturbed sites, the understory is two-layered, with a shrub layer of chokecherry, as well as hawthorn species (*Crataegus succulenta*), Woods' rose (*Rosa woodsii*), serviceberry (*Amelanchier alnifolia* and *sanguinea*). The lowest layer is dominated by sedges (*Carex* species; *Carex sprengelii* is most dominant) and grasses such as western wheatgrass (*Pascopyrum smithii*)*, and* bluebunch wheatgrass (*Pseudoroegneria spicata*). Common forbs include meadow-rue (*Thalictrum dasycarpum*), false Solomon's seal (*Smilacina stellata*), and bedstraw (*Galium* species). Exotic grass species such as Kentucky bluegrass (*Poa pratensis*) are often found throughout these systems. The presence of all age classes rather than just mature woody species, including green ash and other associated trees such as box elder are indicators of healthy functioning condition.

Methodology

Assessing the health and function of hardwood draws follows a modified version of the 1994 Montana Bureau of Land Management/MRWA health method. It is comprised of noting:

- The amount tree regeneration though the presence of all age classes to help ensure "self-perpetuating" stability.
- The amount of woody decadent and dead amounts as large amounts of decadent or dead can indicate severe stress. Some decadence may be natural.

- Utilization of trees and shrubs as heavy browsing by livestock or wildlife can prevent regeneration.
- Shrub regeneration though the presence of all age classes to help ensure "self-perpetuating" stability.
- Total canopy cover of woody species. A woody canopy cover can mitigate raindrop impact, erosive forces, and rates of evaporation.
- Combined canopy cover of the four plant lifeforms. Vegetation cover is instrumental in the ability to mitigate water moving over floodplain or banks.
- Total area occupied by noxious weed species (Weeds can indicate unhealthy system and compete with desirable plants' soil holding ability.
- Total area occupied by undesirable herbaceous species. Most of these species provide less soil holding ability and less desirable forage and wildlife values.

Inventoried data classifies existing conditions as functional, functional at risk, or nonfunctional and is described as follows.

Functional

Relatively undisturbed stands of the green ash/chokecherry habitat type are uncommon in the northern Great Plains, including Ashland and Sioux Ranger Districts. They are identified by diverse layer of shrubs such as chokecherry (*Prunus virginiana*) and Saskatoon serviceberry (*Amelanchier alnifolia*). The stands show a variety of age classes, including seedlings and saplings. Woodlands with more closed canopies have extensive leaf litter on the ground with more native forbs and relatively less cover of grass-like plants.

The presence or absence of a particular understory community may aid in determining the degree of disturbance (both present and historical disturbance) on a particular site. In relatively undisturbed stands, the undergrowth of the green ash/chokecherry habitat type is comprised of two layers – shrub and herbaceous. Shrubs such as chokecherry and Saskatoon serviceberry, dominate the taller and more conspicuous shrub layer. Herbaceous species, such as Sprengel's sedge, northern bedstraw and meadowrue, dominate the second layer. Relatively undisturbed stands will have all age groups of tree species present (seedlings, saplings, pole, and mature). On relatively undisturbed sites, dense stands of the green ash/common chokecherry habitat type limit access by livestock. As the stands open up, livestock use may go up proportionally.

***Fraxinus pennsylvanica/Prunus virginiana* (green ash/common chokecherry) h.t.**

Interior of an undistu:bed *Fraxinus pennsylvanica/Prunus virginiana* (green ash/common chokecherry) h.t. site has a diverse understory dominated by shrubs and herbaceous species. Reproduction of *Fraxinus pennsylvanica* (green ash) is usually high. This site: typical of woody draws throughout the Northern Great Plains.

Figure C-1. Example of a functional green ash/chokecherry habitat type

Stand conditions are also important to wildlife. Wildlife diversity is reduced in declining (open, grass-dominated) stands compared to functional condition stands (Lesica and Marlow, 2013). Bird density and diversity was found to be higher in good condition stands. Rufous-sided towhee, black-capped chickadee, field sparrow, American goldfinch, dark-eyed junco, small flycatchers, orange crowned warbler, Wilson's warbler and Swainson's thrush were all more common in closed-canopy woodlands. Deer mice, white - footed mice, and woodrats occurred more commonly in closed-canopy stands, while no mammalian species was more common in the open stands. Of the 81 species of birds observed in ash woodlands, 65 species require woodland habitat. Closed-canopy stands have greater numbers of tree-nesting and shrub-nesting birds but fewer ground-nesting species. Mourning doves, American goldfinches, Bell's vireos, yellow warblers, rufous-sided towhees, and brown-headed cowbirds are generally more abundant in stands with a more closed canopy and denser, tall shrub layer. Bird species are not significantly more abundant in the more open stands.

Functional At Risk

Long-term moderate disturbance greatly reduces the canopy cover of the taller shrubs, severely limits the regeneration of green ash, and increases dramatically the abundance and cover of western snowberry and woods rose.

Maintaining moderate levels of grazing can reduce reproduction of tree species. In addition, hot season grazing can also present challenges to maintenance or improvement of green ash stands. Many of the sapling and pole size trees begin to show signs of damage. Reducing the seedling and sapling stages of the overstory tree species will eventually result in a decline of the tree population. If the degree of disturbance continues over an extended period of time, the trees will eventually be eliminated from the site.

In addition to its impact on the tree layer, grazing can reduce both the abundance and canopy cover of the understory layer of the desirable shrub and herbaceous species. Less desirable species such as western snowberry, woods rose, hawthorn, and Kentucky bluegrass can begin to invade the stand.

Under heavy grazing pressures and long-term use during moist conditions (compaction effects), tree reproduction is either severely restricted or completely eliminated. At this stage, most of the saplings and pole sized trees have either been eliminated by trampling and/or rubbing, or browsed back until they are dead. High levels of grazing cause the stand to open up allowing the more sun tolerant, less desirable species such as western snowberry, woods rose, succulent hawthorn, and Kentucky bluegrass to dominate.

***Fraxinus pennsylvanica/Prunus virginiana* (green ash/common chokecherry) h.t.**
Interior of a moderately disturbed stand. Most of the desirable shrubs have been eliminated and replaced by *Symphoricarpos occidentalis* (western snowberry) and *Poa pratensis* (Kentucky bluegrass). Tree reproduction has been sharply reduced. This site: typical of woody draws throughout the Northern Great Plains.

Figure C-2. Example of an "at risk" green ash/chokecherry habitat type

Non Functional

Prolonged periods of severe overgrazing eliminates the shrub layer and replaces it with a herbaceous layer, resulting in a stand of only older, decadent trees and a very open understory. The understory may be so severely impacted that most of the less desirable species such as western snowberry, woods rose, hawthorn, and Kentucky bluegrass are also eliminated resulting in large amounts of exposed soil. Green ash continues to regenerate and produce seedlings. However, browsing is so intense that none of them make it past the seedling stage. The stand is comprised of older aged trees (mature to decadent) and is missing the seedling, sapling, and pole stages of development. If the browsing pressures continue at a high level for long periods of time, the stand may be converted from a forested setting to a shrubland or grassland site.

When the habitat type is severely disturbed it may be dominated by the buffaloberry, hawthorn, woods rose, or the western snowberry. Close observation of remnant species, such as green ash will aid in determination of the site potential.

There are situations where the channel has incised, and there is minimal potential for restoring original hydrology. There is still a significant component of green ash, common chokecherry, and other woody species present. These erosion-disturbed draws are drier. As a result, the presence of Rocky Mountain juniper increases relative to the other woody species on the site. In extreme cases, the site may lose the reproductive capability of all woody species.

When a stand is at this stage, the prospect of returning the site to its former state is very difficult if not impossible (restoration would be extremely expensive in terms of both labor and money.) Therefore, if a one wants to maintain the stand of trees, the most cost effective method is to change the management on the site BEFORE the site is too degraded.

***Fraxinus pennsylvanica/Prunus virginiana* (green ash/common chokecherry) h.t.**

Interior of a severely disturbed stand. Most of the shrubs have been eliminated and replaced by species such as *Poa pratensis* (Kentucky bluegrass), *Bromus japonicus* (Japanese brome), widely scattered *Artemisia frigida* (fringed sagewort) and *Symphoricarpos occidentalis* (western snowberry). This site is all too typical of woody draws throughout the Northern Great Plains.

Figure C-3. Example of a non-functional green ash/chokecherry habitat type

On the Sioux District 137 sites were inventoried of which 21 percent were found to be functioning, 63 percent were "at risk", and 22 percent were non-functional. On the Ashland District, of the 299 acres inventoried, approximately 16 percent were considered functional, 59 percent considered at risk, and 25 percent considered not functioning. When averaging these two Pine Savanna units, 19 percent of inventoried areas are functional, 61 percent are "at risk", and 20 percent are non-functional. Table summarizes these findings.

Table C-1. Summary of green ash woodlands condition ratings

	Functional	**Functional at Risk**	**Non Functional**	**Total**
Sioux Ranger District				
# of Sites Surveyed	29	86	22	137 Sites
Percentage of Inventoried Sites by Condition	21%	63%	16%	
Ashland Ranger District				
Acres Surveyed	49	175	75	299 Ac
Percentage of Inventoried Acres by Condition	16%	59%	25%	
Pine Savanna Unit (Sioux and Ashland Combined)				
Average Percentage Inventoried areas by Condition	19%	61%	20%	

Table details the Sioux District inventoried sites.

Table C-2. Green ash woodlands condition ratings by site – Sioux District (North and South Cave Hills, Slim Buttes, East Short Pines and West Short Pines are in South Dakota, while the Long Pines, Ekalaka Hills, and Chalk Buttes are in MT)

Land Unit	Allotment	Key-ID	PFC Score	PFC Rating	Acres / Comments
North Cave Hills	Davis Draw	2001 - FS01080301B3003	71	Functional at risk	3
North Cave Hills	Davis Draw	2001 - FS01080301B3004	63	Functional at risk	6
North Cave Hills	Davis Draw	2001 - FS01080301B3005	66	Functional at risk	2
North Cave Hills	Davis Draw	2001 - FS01080301T3003	63	Functional at risk	2
North Cave Hills	Davis Draw	2001 - FS01080301T3004	71	Functional at risk	1
North Cave Hills	Davis Draw	2001 - FS01080301T3005	71	Functional at risk	1
North Cave Hills	Jenkins	1997-1998 – Middle Pasture East Draw (Section 14 T21N, R5E)		Functional	
North Cave Hills	Pehlam Julberg	2001 - FS01080301T3009	71	Functional at risk	2
North Cave Hills	Pehlam Julberg	FS01080301T3010	71	Functional at risk	2
North Cave Hills	Pehlam Julberg	FS01080301T3011	83	Functional	1
North Cave Hills	Pehlam Julberg	1997-1998 - Middle Pasture, South Draw Section 1, T21N, R5E		Functional	
North Cave Hills	Pehlam Julberg	1997-1998 - Riley Spring Section 36, T22N, R5E		Functional	
North Cave Hills	Schleichart	2001 - FS01080301B3002	71	Functional at risk	26
North Cave Hills	Schleichart	2001 - FS01080301T3001	66	Functional at risk	2
North Cave Hills	Schleichart	2001 - FS01080301T3006	74	Functional at risk	2
North Cave Hills	Schleichart	2001 - FS01080301T3008	74	Functional at risk	6
North Cave Hills	Schleichart	1997-1998 – Sawmill Canyon, Section 16 T22N, R5E		Functional	
North Cave Hills	Schleichart	1998 - Ice Box Canyon, Section 16, T22N, R5E		Functional	
South Cave Hills	JA Clarkson	2001 - FS01080301C3002	63	Functional at risk	2
South Cave Hills	JA Clarkson	2001 - FS01080301C3003	74	Functional at risk	1
South Cave Hills	JA Clarkson	2001 - FS01080301T3020	69	Functional at risk	2
South Cave Hills	JA Clarkson	2001 - FS01080301T3021	66	Functional at risk	2
South Cave Hills	JA Clarkson	2001 - FS01080301T3022	60	Functional at risk	1
South Cave Hills	JA Clarkson	2001 - FS01080301T3023	60	Functional at risk	1
South Cave Hills	JA Clarkson	1999 - Sections 24 and 25, T21N, R4E		Functional at risk	

Land Unit	Allotment	Key-ID	PFC Score	PFC Rating	Acres / Comments
South Cave Hills	JB Clarkson	2001 - FS01080301C3004	57	Non Functional	7
South Cave Hills	JB Clarkson	2001 - FS01080301C3005	71	Functional at risk	4
South Cave Hills	JB Clarkson	2001 - FS01080301T3025	71	Functional at risk	2
South Cave Hills	JB Clarkson	2001 - FS01080301T3026	66	Functional at risk	1
South Cave Hills	JB Clarkson	2001 - FS01080301T3027	69	Functional at risk	4
South Cave Hills	JB Clarkson	2001 - FS01080301T3028	74	Functional at risk	1
South Cave Hills	JB Clarkson	2001 - FS01080301T3029	66	Functional at risk	3
South Cave Hills	JB Clarkson	2001 - FS01080301T3030	71	Functional at risk	11
South Cave Hills	JB Clarkson	2001 - FS01080301T3031	74	Functional at risk	3
South Cave Hills	JB Clarkson	1999 in Timber Canyon, sections 30, T21N,		Functional	
South Cave Hills	JB Clarkson	1999 in Timber Canyon, sections 31, T21N,		Functional	
South Cave Hills	JB Clarkson	1999 - West Fork Peterson Canyon, section 25, T21N, R4E		Functional at risk	
South Cave Hills	John Brown	2001 - FS01080301C3006	66	Functional at risk	7
South Cave Hills	John Brown	2001 - FS01080301C3007	66	Functional at risk	3
South Cave Hills	John Brown	2001 - FS01080301C3008	63	Functional at risk	5
South Cave Hills	John Brown	2001 - FS01080301C3009	69	Functional at risk	1
South Cave Hills	John Brown	2001 - FS01080301C3010	74	Functional at risk	3
South Cave Hills	John Brown	2001 - FS01080301T3012	77	Functional at risk	14
South Cave Hills	John Brown	2001 - FS01080301T3014	71	Functional at risk	2
South Cave Hills	John Brown	1996 – John Brown		Functional at risk	
South Cave Hills	John Brown	1996 – Petereson Canyon		Functional at risk	
South Cave Hills	John Brown	1997 - John Brown Spring #2		Functional	
South Cave Hills	John Brown	1998 - Holdup Canyon		Functional at risk	
South Cave Hills	Van Offern	2001 - FS01080301T3015	74	Functional at risk	2
South Cave Hills	Van Offern	2001 - FS01080301T3016	74	Functional at risk	1
South Cave Hills	Van Offern	2001 - FS01080301T3017	74	Functional at risk	1
South Cave Hills	Van Offern	2001 - FS01080301T3018	66	Functional at risk	4
South Cave Hills	Van Offern	2001 - FS01080301T3019	69	Functional at risk	1
South Cave Hills	Van Offern	1999 - Mckinsey Gulch during		Functional at risk	

Land Unit	Allotment	Key-ID	PFC Score	PFC Rating	Acres / Comments
East Short Pines	Lone Mountain	2001 - FS01080301T3038	71	Functional at risk	6
East Short Pines	Dunn	2001 - FS01080301T3034	69	Functional at risk	2
East Short Pines	Dunn	2001 - FS01080301T3035	77	Functional at risk	5
East Short Pines	Dunn	2001 - FS01080301T3036	83	Functional	5
East Short Pines	Dunn	2001 - FS01080301T3037	77	Functional at risk	2
East Short Pines	Dunn	2001 - FS01080301T3032	69	Functional at risk	9
East Short Pines	Dunn	2001 - FS01080301T3033	71	Functional at risk	3
East Short Pines	Dunn	1999 - Adams Gulch, Sections 14, 15, T16N, R3E		Functional	
East Short Pines	Box Springs	2001 - FS01080301T3041	71	Functional at risk	4
East Short Pines	Box Springs	2001 - FS01080301T3042	83	Functional	2
East Short Pines	Box Springs	2001 - FS01080301T3043	71	Functional at risk	1
East Short Pines	Box Springs	2001 - FS01080301T3039	69	Functional at risk	5
East Short Pines	Box Springs	2001 - FS01080301T3040	74	Functional at risk	6
East Short Pines	Box Springs	2001 - FS01080301T3044	74	Functional at risk	6
East Short Pines	Box Springs	2001 - FS01080301T3045	71	Functional at risk	3
Slim Buttes	Antelope	2004 - 01080304LT010 - Reach 1	83	Functional	
Slim Buttes	Antelope	2004 - 01080304LT010 - Reach 2	91	Functional	
Slim Buttes	Antelope	2004 - 01080304LT010 - Reach 3	80	Functional	
Slim Buttes	Antelope	2004 - 01080304LT010 - Reach 4	66	Functional at risk	
Slim Buttes	Antelope	2004 - 01080304LT010 - Reach 5	83	Functional	
Slim Buttes	Antelope	2004 - 01080304LT010 - Reach 6	77	Functional at risk	
Slim Buttes	Antelope	2004 - 01080304LT010 - Reach 7	77	Functional at risk	
Slim Buttes	Basin Valley	2004 - 01080304LT013 Reach 1	--	Functional	
Slim Buttes	Basin Valley	2004 - 01080304LT013 Reach 2	74	Functional at risk	
Slim Buttes	Basin Valley	2004 - 01080304LT013 Reach 3	89	Functional	
Slim Buttes	Basin Valley	2004 - 01080304LT013 Reach 4	89	Functional	
Slim Buttes	Cedar Canyon	2004 - 01080304LT011 Reach 1		Functional	
Slim Buttes	Cedar Canyon	2004 - 01080304LT011 Reach 2		Functional	
Slim Buttes	Cedar Canyon	2004 - 01080304LT011 Reach 3	77	Functional at risk	

Land Unit	Allotment	Key-ID	PFC Score	PFC Rating	Acres / Comments
Slim Buttes	Southwest Bonniwell	01080303WS001A		Functional at risk	
Slim Buttes	Southwest Bonniwell	01080303WS001B		Functional	
Slim Buttes	Southwest Bonniwell	01080303WS002A		Functional at risk	
Slim Buttes	North Bonniwell	01080303WS001C		Functional at risk	
Slim Buttes	North Bonniwell	01080303WS001D		Functional	
Slim Buttes	Waugh	2004 - 01080304LT012 Reach 1	83	Functional	
Slim Buttes	Waugh	2004 - 01080304LT012 Reach 2	89	Functional	
Slim Buttes	Waugh	2004 - 01080304LT012 Reach 3	83	Functional	
Slim Buttes	Waugh	2004 - 01080304LT012 Reach 4	80	Functional	
Slim Buttes	Waugh	2004 - 01080304LT012 Reach 5	80	Functional	
Slim Buttes	Waugh	2004 - 01080304LT012 Reach 6	74	Functional at risk	
Slim Buttes	Waugh	2004 - 01080304LT012 Reach 7	71	Functional at risk	
Slim Buttes	Waugh	2004 - 01080304LT012 Reach 8	63	Functional at risk	
Slim Buttes	Waugh	2004 - 01080304LT012 Reach 9	86	Functional	
Long Pines	Belltower	2005 Survey	74	Functional at risk	Burned in 1988
Long Pines	Belltower	2005 Survey; Site ID: 01080305DS003; Transect # 1 is located T2S, R61E, S30, NWSW	67	Functional at risk	Burned in 1988; Maverick Gulch area
Long Pines	Belltower	2005 Survey; Site ID: 01080305DS003; Transect # 2 is located T2S, R61E, S30, NWSW	67	Functional at risk	Burned in 1988; Maverick Gulch area
Long Pines	Belltower	2005 Survey; Site ID: 01080305DS003; Transect # 3 is located T2S, R61E, S30, NWSW	64	Functional at risk	Burned in 1988; Maverick Gulch area
Long Pines	Belltower	2005 Survey; Site ID: 01080305DS003; Transect # 4 is located T2S, R61E, S30, NWSW	57	Non Functional	Burned in 1988; Maverick Gulch area
Long Pines	Belltower	2005 Survey; Site ID: 01080305DS003; Transect # 5 is located T2S, R61E, S30, SWSE	62	Functional at risk	Burned in 1988; Maverick Gulch area
Long Pines	Belltower	2005 Survey; Site ID: 01080305DS003; Transect # 6	69	Functional at risk	Burned in 1988; Maverick Gulch area
Long Pines	Belltower	2005 Survey; Site ID: 01080305DS003; Transect # 7 is located T2S, R61E, S30, SWSE	55	Non Functional	Burned in 1988; Maverick Gulch area

Land Unit	Allotment	Key-ID	PFC Score	PFC Rating	Acres / Comments
Long Pines	Belltower	2005 Survey; Site ID: 01080305DS003; Transect # 8 is located T2S, R61E, S30, SWSE	64	Functional at risk	Burned in 1988; Maverick Gulch area
Long Pines	Belltower	2005 Survey; Site ID: 01080305LT001 Transect # 001; Paper Birch dominant	79	Functional at risk	Burned in 1988; North unit
Long Pines	Brewer	2005 Survey; Site ID: 01080305DS004; Transect # 001 is located T3S, R61E, S9 NWSE	62	Functional at risk	Burned in 1988
Long Pines	Brewer	2005 Survey; SITE ID: 01080305DS004-002; Sec 9 T3S R61E QR SW/NE	62	Functional at risk	Burned in 1988
Long Pines	Brewer	2005 Survey; SITE ID: 01080305DS004-003; Sec 9 T3S R61E QR SW/NE	57	Non Functional	Burned in 1988
Long Pines	Capitol Rock	2004 Survey; Site ID# 01080304LT006-001; Chiesman Draw		Functional at risk	Burned in 1988
Long Pines	Capitol Rock	2004 Survey; Site ID# 01080304LT006-002; Chiesman Draw		Functional at risk	
Long Pines	Carter	2005 Survey; Site ID: 01080305DS006 – 001; T2S, R62E, S9, SENW	55	Non Functional	Burned in 2002
Long Pines	Carter	2005 Survey; Site ID: 01080305DS006 – 002; T2S, R62E, S9, SENW	31	Non Functional	Burned in 2002
Long Pines	Carter	2005 Survey; Site ID: 01080305DS006 – 003; T2S, R62E, S9, SENW	45	Non Functional	Burned in 2002
Long Pines	Carter	2005 Survey; Site ID: 01080305DS006 – 004; T2S, R62E, S9, SENW	50	Non Functional	Burned in 2002
Long Pines	Carter	2005 Survey; Site ID: 01080305DS006 – 005; T2S, R62E, S9, SENW	36	Non Functional	Burned in 2002
Long Pines	Carter	2005 Survey; Site ID: 01080305DS006 – 006; T2S, R62E, S9, SENW	26	Non Functional	Burned in 2002
Long Pines	Devils Canyon - Neece	2005 Survey; Site ID: 01080305DS009 – 001; T1S, R61E, SEC 6, SENW	40	Non Functional	Burned in 1988
Long Pines	Devils Canyon - Neece	2005 Survey; Site ID: 01080305DS009 – 002; T1S, R61E, SEC 6, SENW	14	Non Functional	Burned in 1988
Long Pines	Devils Canyon - Neece	2005 Survey; Site ID: 01080305DS009 – 003; T1S, R61E, SEC 6, SENW	36	Non Functional	Burned in 1988
Long Pines	Devils Canyon - Neece	2004 Survey; Site ID 01080304LT001 – 001; T1S, R61E, Sec.17, NWNW; Iron Springs		Functional at risk	
Long Pines	Devils Canyon - Neece	2004 Survey; Site ID 01080304LT001 – 002; T1S, R61E, Sec. 18, NENE ; Iron Springs		Functional at risk	

Land Unit	Allotment	Key-ID	PFC Score	PFC Rating	Acres / Comments
Long Pines	Devils Canyon - Neece	2004 Survey; Site ID 01080304LT001 – 003; T1S, R61E, Sec 17, NW1/4, NWNW ¼ 1/4; Iron Springs		Functional at risk	
Long Pines	Devils Canyon - Neece	2005 Survey (unk. Site ID – data from EA)	33	Non Functional	Burned in 1988 & 2002
Long Pines	Devils Canyon - Neece	2005 Survey (unk. Site ID – data from EA)	36	Non Functional	Burned in 1988 & 2002
Long Pines	Devils Canyon - Neece	2005 Survey (unk. Site ID – data from EA)	36	Non Functional	Burned in 1988 & 2002
Long Pines	Devils Canyon - Neece	2004 Survey; Site ID 01080304LT001 – 004; T1S, R61E, Sec 17, NW, NWNW		Functional at risk	
Long Pines	Kennedy	2005 Survey; Site ID: 01080305DS005 - 001; T1N, R61E, S16, SWNW	48	Non Functional	
Long Pines	Kennedy	2005 Survey; Site ID: 01080305DS005 - 003; T1N, R61E, S16, SENW	62	Functional at risk	
Long Pines	Kennedy	2005 Survey; Site ID: 01080305DS005 – 00x; T1N, R61E, S16, SWNW	69	Functional at risk	Burned in 1988
Long Pines	Kennedy	2005 Survey; Site ID: 01080305DS005 – 00x; T1N, R61E, S16, SWNW	57	Non Functional	Burned in 1988
Long Pines	McClary Adm Site	2005 Survey; Site ID: 01080305DS001; T2S R61E Sec 36 NW/SE	67	Functional at risk	Burned in 1988 & 2002
Long Pines	McClary Adm Site	2005 Survey; Site ID: 01080305DS002; T2S R61E Sec 36 NW/SE	45	Non Functional	Burned in 1988 & 2002
Long Pines	McClary Adm Site	2005 Survey; Site ID: 01080305DS003; T2S R61E Sec 36 NW/SE	43	Non Functional	Burned in 1988 & 2002
Long Pines	Lampkin Gulch	2005 Survey; Site ID 01080305DS007 - 001; 1S, 60E, S25, NWNE; Halbert Gulch	55	Non Functional	Burned in 1988 & 2002
Long Pines	Lampkin Gulch	2005 Survey; Site ID 01080305DS007 - 002; 1S, 60E, S25, NWNE; Halbert Gulch	48	Non Functional	Burned in 1988 & 2002

On the Ashland District, approximately 299 National Forest System acres of main stem hardwood draws were inventoried and their condition classified prior to recent fires. Of the 299 acres, approximately 21 percent were considered functional, 54 percent considered at risk, and 25 percent considered non-functional prior to recent fires. Of the 299 acres, approximately 16 percent were considered functional, 59 percent considered at risk, and 25 percent considered not functioning after recent fires (2013 Ashland post-fire assessment). Figure and Table provides further details.

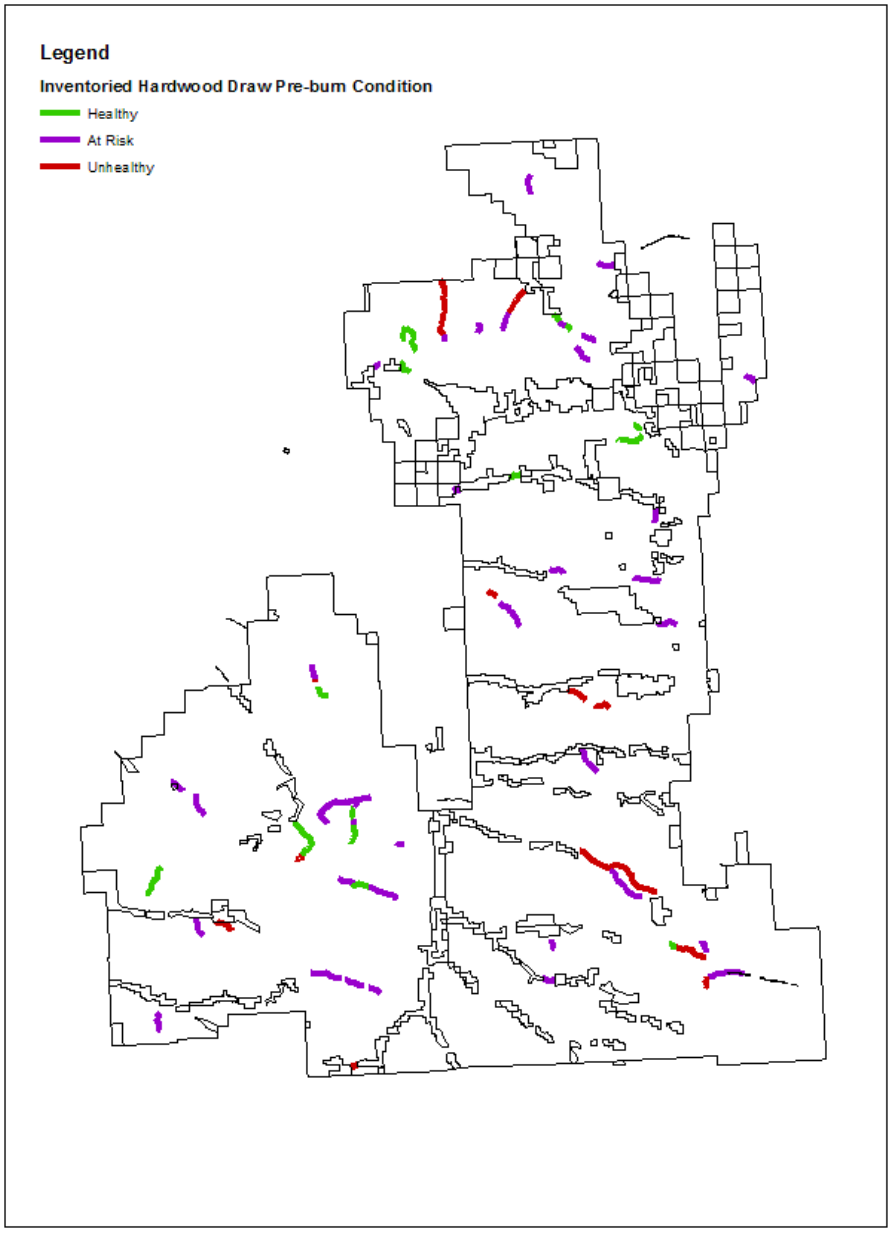

Figure C-4. Inventoried hardwood draw preburn condition

Table C-3. Inventoried hardwood draw pre and post -burn condition by allotment and pasture

Allotment/Pasture	Functional	At Risk	Non-Functional	Total (Ac)
Preburn Existing Condition (Ac)				
3 X BAR/3 X Bar North		0	5	5
ANDERSON-DIAMOND BUTTE/EAST	2	3	9	14
ASH CREEK/ASH CREEK	11	7	13	31
ASH CREEK/ASH CREEK ON/OFF	0			0
BEAVER CREEK/SOUTH	4	5		9
BLOOM CREEK/BLOOM CREEK		8		8
BREWSTER GULCH/NORTH		5		5
COAL CREEK/COAL CREEK	7	3		10
COLEMAN DRAW/WEST		3		3
COW CREEK/EAST	4	12		17
COYOTE/EAST		5		5
CUB CREEK - A+E/BUTTE		8		8
CUB CREEK - A+E/CUB CREEK		8		8
DEER CREEK/NORTH		4	6	10
EAST FORK/MAIN	2			2
EAST HOME/EAST HOME	7			7
ELK CREEK/ELK CREEK		6		6
ELK RIDGE/SOUTH		3		3
FIFTEEN MILE/EAST			8	8
FIFTEEN MILE/WEST			1	1
INDIAN CREEK/UPPER INDIAN		4		4
KING CREEK/UPPER DRY CR	4	3	1	8
LISCOM BUTTE/SOUTH		4		4
LOWER HOME/WEICHMAN ON/OFF	5			5
NORTH LYON/NORTH LYON			22	22
PADGET CREEK/UPPER		16		16
RED BULL/BULL	9	0	3	12
SHORTY CREEK/MIDDLE		4		4
SHORTY CREEK/WEST			0	0
SKINNER GULCH/SKINNER GULCH		5		5
SOUTH LEE CR/SOUTH LEE CR		5		5
SOUTH LYON/EAST		10		10
STAG ROCK/UPPER STAG ROCK		2		2
STEWART/NORTHEAST		2		2
TAYLOR CREEK/TAYLOR CREEK			3	3
TEN MILE/NORTH		8	2	10
TEN MILE - THREE MILE/NORTH		7		7
TIMBER CREEK/TIMBER CREEK	7			7

Allotment/Pasture	Functional	At Risk	Non-Functional	Total (Ac)
UPPER HOME/LEMONADE		4		4
WEST HOME/EAST	2			2
WEST O'DELL/POKER JIM		4		4
WEST TOOLEY/CARSON ON/OFF			0	0
WEST TOOLEY/LITTLE BEAR			1	1
WEST TOOLEY/LITTLE BEAR RIPARIAN			2	2
WHITETAIL/MAXWELL		5		5
Pre-burn Total Acres	64	160	75	299
Pre-burn Percentages	21%	54%	25%	100%
Post-burn Condition (Ac)[48]				
Post-burn Total Acres	49	175	75	299
Post-burn Percentages	16%	59%	25%	100%

[48] Of the 299 inventoried NFS green ash acres, 142 acres or 47% were burned in recent fires. Of the 142 acres burned, 22% (31 acres) of functioning stands burned, 54% (77 acres) of at risk stands burned, and 24% (34 acres) of no-functioning stands burned. Of the 31 acres of functioning stands burned, 15 acres were burned at moderate and high burn severity where these areas may likely be set back to "at risk" conditions.

Appendix D – Allotments within Designated or Other Special Areas

This appendix provides further detail relative to permitted livestock allotments and wilderness areas, research natural areas, special interest areas, wild horse territory, grizzly bear recovery zone, bison tolerance zones, and greater sage-grouse core and general habitat areas.

Wilderness Areas

There are nine allotments that lie partially within wilderness areas on the Custer Gallatin National Forest. One active allotment is within the Lee Metcalf Wilderness and eight allotments are within the Absaroka Beartooth Wilderness as displayed in Table and Figure . Minor infrastructure associated with the management of these allotments include fences, water lines, and water tanks. Rangeland and wilderness managers coordinate on access, repair, or ongoing management needs such as signage, gate issues and weed treatments.

Per Gallatin National Forest Plan Appendix F Wilderness Management Plans, allotment management plans for allotments in wilderness areas will specifically identify: the use of motor vehicles, motorized equipment, or other forms of mechanical equipment; range improvement structures and installations to be maintained, constructed, or reconstructed in achieving range management objectives, including maintenance standards; the means to handle emergencies; and the grazing system to be followed.

Table D-1. Custer Gallatin National Forest allotments located partially within wilderness areas

Allotment and Wilderness Area	Allotment Status	Allotment Acres Inside Wilderness	Allotment Acres Outside Wilderness	Primary Range Acres Inside Wilderness
Lee Metcalf Wilderness (Monument Mountain Unit)				
Sage Creek (#00722)	Active	9347	5253	1307
Absaroka Beartooth Wilderness				
Grouse Creek (#00112)	Vacant	402	1800	164
Hawley (#00113)	Active	115	108	53
Lost Creek (#00120)	Active	7544	557	1718
Main Boulder (#00136)	Vacant	133	1432	1
Deep Creek South (#00206)	Vacant	3825	80	355
Sixmile South (#00228)	Vacant	3502	3424	235
Suce Creek (#00232)	Vacant	3943	1582	60
Slip and Slide (#00317)	Active	657	6121	61
AB Wilderness Subtotal		20121	15104	2647
Grand Total		29468	20357	3954

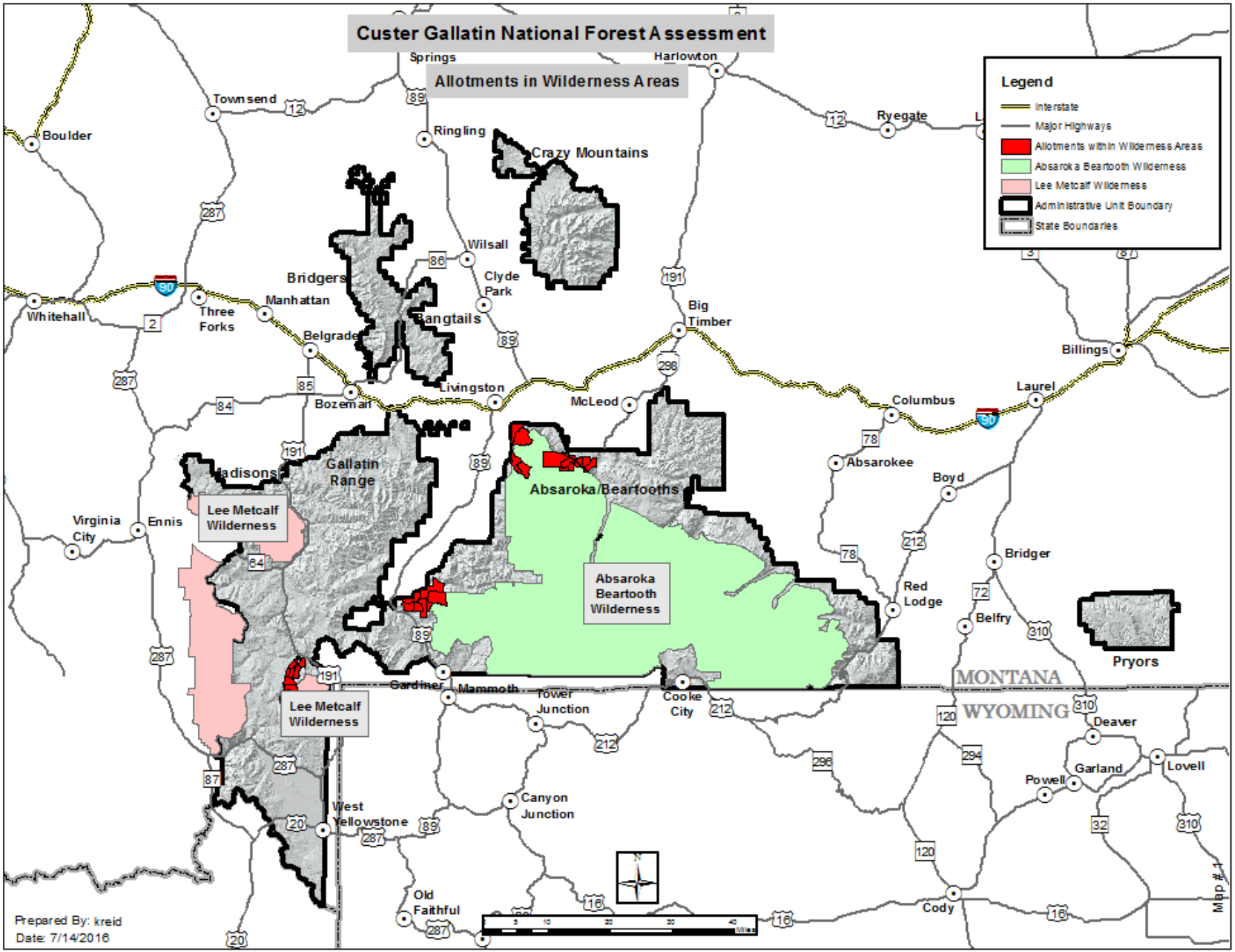

Figure D-1. Allotments in wilderness areas – general view

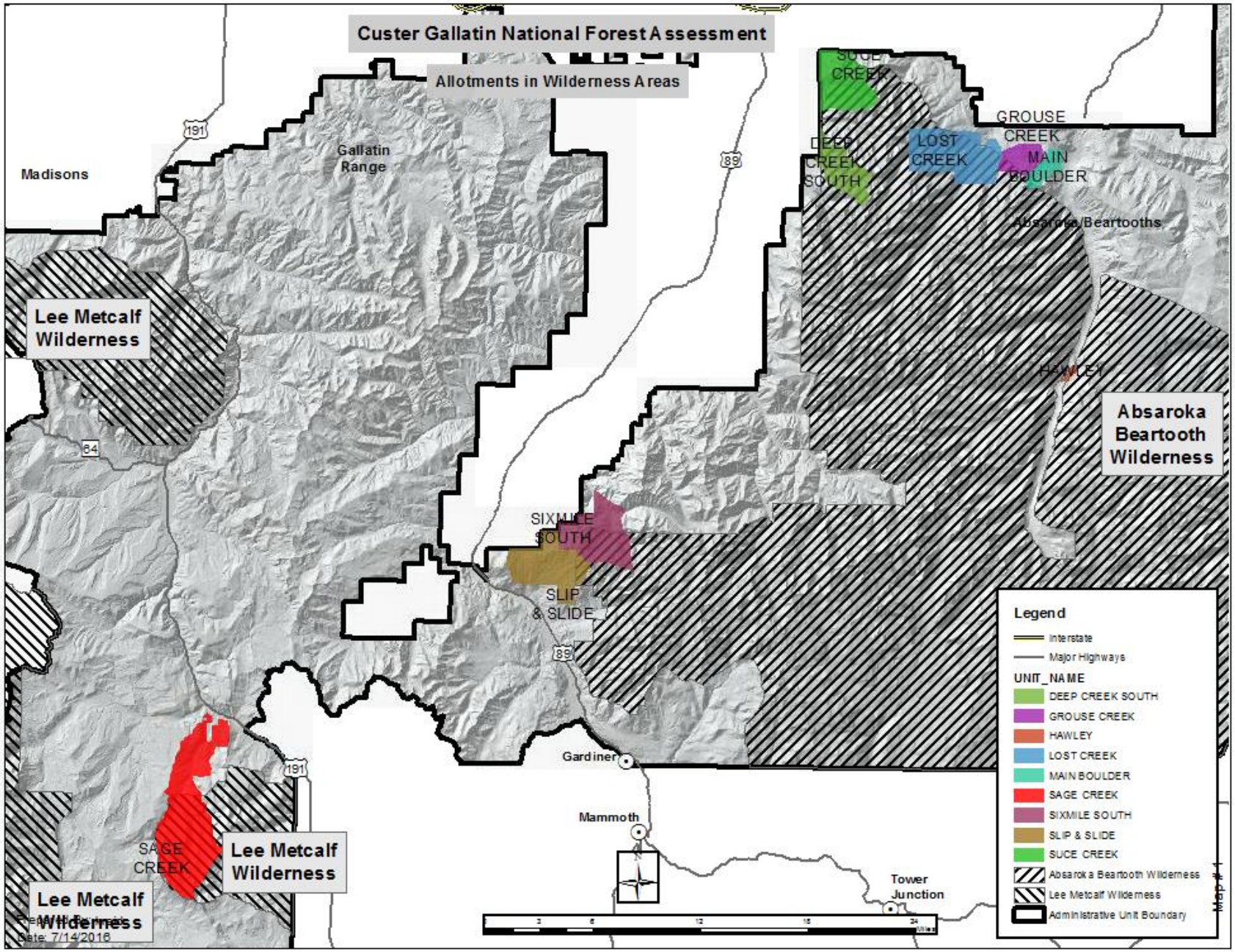

Figure D-2. Allotments within wilderness areas – close-up view

Two House Committee on Interior and Insular Affairs Reports (95—620 and 95—1321') specifically provided guidance as to how section 4(d) (4) (2) of the Wilderness Act should be interpreted and includes the following regarding use of motorized/mechanized equipment for allotment management:

> 2. The maintenance of supporting facilities existing in an area prior to its classification as wilderness (including fences, line cabins, water wells and lines, stock tanks, etc.), is permissible in wilderness. Where practical alternatives do not exist, maintenance or other activities may be accomplished through the occasional use of motorized equipment. This may include, for example, the use of backhoes to maintain stock ponds, pickup trucks for major fence repairs, or specialized equipment to repair stock watering facilities. Such occasional use of motorized equipment should be expressly authorized in the grazing permits for the area involved. The use of motorized equipment should be based on a rule of practical necessity and reasonableness. For example, motorized equipment need not be allowed for the placement of small quantities of salt or other activities where such activities can reasonably and practically be accomplished on horseback or foot. On the other hand, it may be appropriate to permit the occasional use of motorized equipment to haul large quantities of salt to distribution points. Moreover, under the rule of reasonableness, occasional use of motorized equipment should be permitted where practical alternatives are not available and such use would not have a significant adverse impact on the natural environment. Such motorized equipment uses will normally only be permitted to those portions of a wilderness area where they had occurred prior to the area's designation as wilderness or are established by prior agreement.

The minimum requirements decision guide process should be used to determine the reasonableness for use of motorized/mechanized equipment and is consistent under the minimum requirements decision guide *"Criteria for Determining Necessity – Is action necessary to meet Valid Existing Rights or Special Provisions of Wilderness Legislation."*

Research Natural Areas (RNAs) / Special Interest Areas (SIAs)

Of the ten designated research natural areas and two special interest areas, two research natural areas and one special interest area contain portions of allotments. Poker Jim Research Natural Area is unfenced and falls within the West O'Dell allotment on the Ashland District. Although model results show about 75 percent of the research natural area being within secondary rangeland and 25 percent are lands not capable for grazing, grazing does occur (pers. Comm., S. Studiner). A portion of Sliding Mountain Research Natural Area falls within the Sixmile South allotment on the Yellowstone District. About 9 percent of research natural area are found within secondary rangeland and 91 percent are lands not capable for grazing

Portions of Bangtail, Jackson Creek, North Canyon, South Canyon, and Willow Creek allotments are located within the Bangtail Special Interest Area (for more detail on this special interest area, see the Research Natural Areas / Special Interest Areas Report (Reid, 2017). Primary rangelands make up approximately 40 percent of the special interest area. About 60 percent are lands not capable for grazing. About 11 percent of the area is primary rangelands where there is likely to be more concentrated grazing use near water sources (within 1/8 mile). Noxious weeds are located along most major transportation routes within the special interest area. Table and Figure display the amount and location of allotment primary, secondary, and non-capable rangelands within the Bangtail Special Interest Area.

Table D-2. Amount of allotment primary rangeland within the Bangtail Special Interest Area

Capability	Bangtail	Jackson Creek	North Canyon	South Canyon	Willow Creek	Grand Total	Percent of SIA
Primary -Dist to water 0-1/8 mile	65		26	312		403	11%
Primary -Dist to water 1/8-1/4 mile	122	1	13	424		560	15%
Primary -Dist to water 1/4-1/2 mile	229	7	58	597	2	893	24%
Primary -Dist to water 1/2-3/4 mile	118		7	263	5	394	10%
Primary -Dist to water 3/4-1 mile	8			21	2	31	1%
Primary Range Total	542	8	105	1617	10	2281	60%
Secondary Range				4		4	0%
Uncapable Ground	179	1	219	1063	47	1509	40%
Grand Total	721	9	324	2684	57	3794	

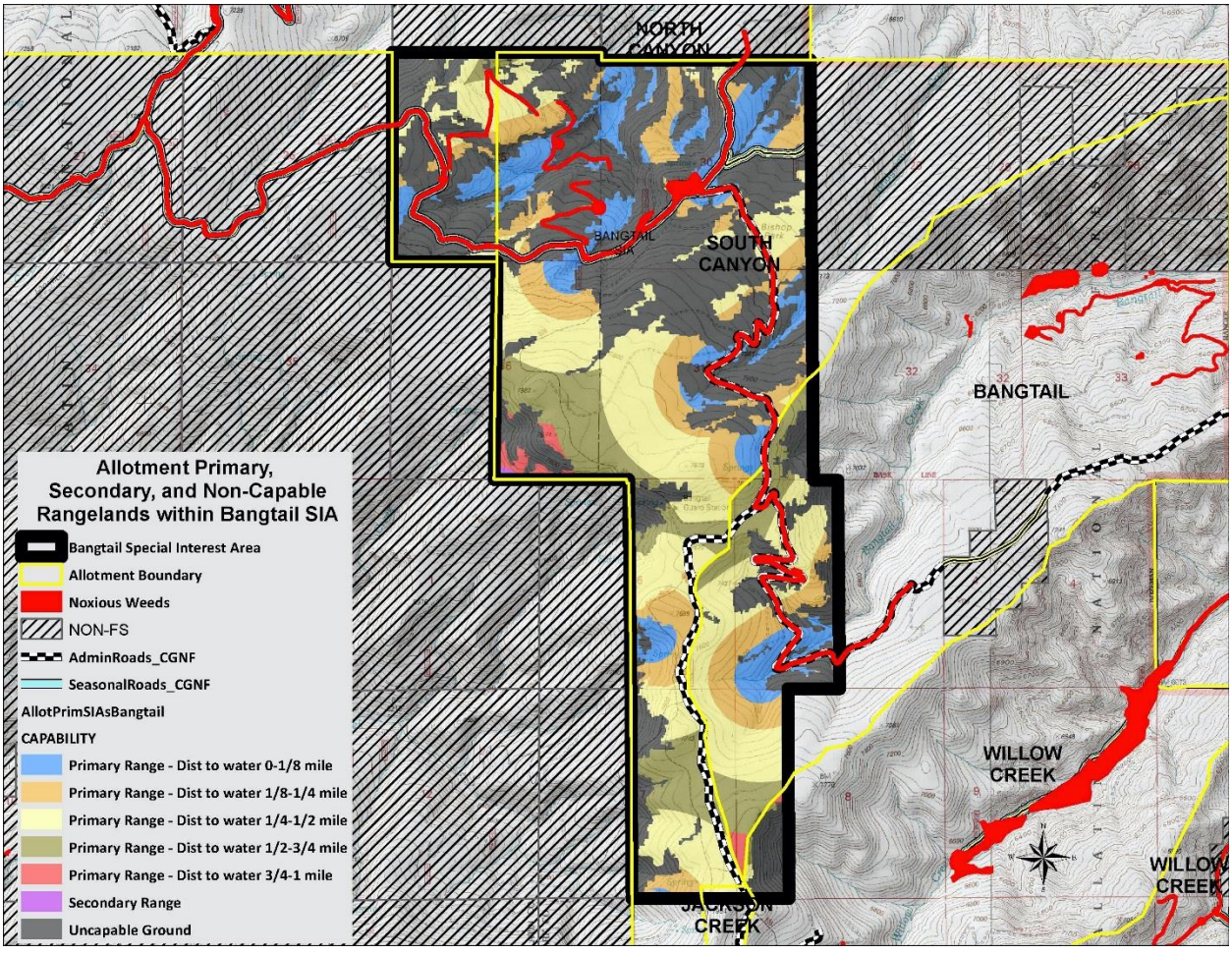

Figure D-3. Allotments and primary rangelands within the Bangtail Special Interest Area

Pryor Mountain Wild Horse Territory

There are no allotments or permitted livestock within the Pryor Mountain wild horse territory.

Grizzly Bear Recovery Zone

Within the Greater Yellowstone Ecosystem, the grizzly bear population and its habitat will be managed utilizing a management approach that identifies a recovery zone and adjacent areas where occupancy by grizzly bears is anticipated and acceptable.

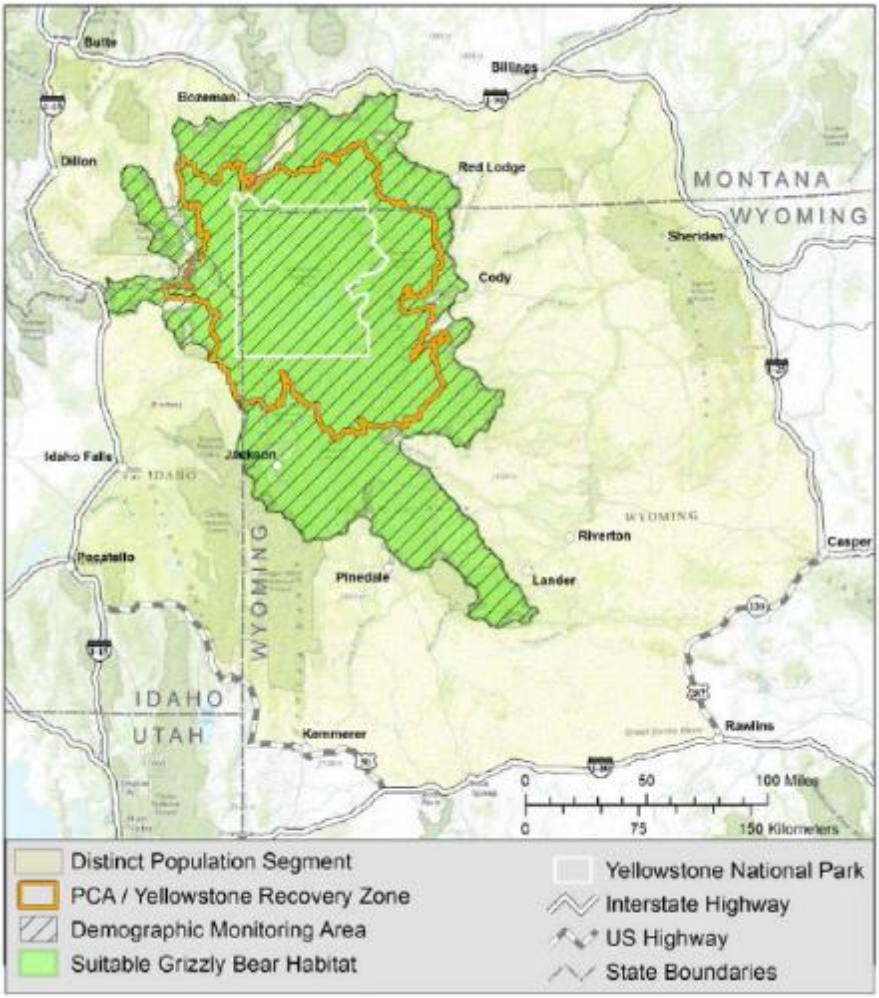

Figure D-4. General view of the recovery zone.[49]

The grizzly bear habitat standard outlined in the Forest Plan, as amended, and the conservation strategy relative to livestock outlines that the number and acreage of livestock allotments, and number of permitted sheep animal months will not exceed 1998 levels inside the recovery zone. Existing sheep allotments will be phased out as the opportunity arises with willing permittees. Since the 1998 timeframe, sheep allotments on the Custer Gallatin National Forest have been phased out.

[49] FINAL DRAFT of the Draft 2016 Conservation Strategy for the Grizzly Bear in the Greater Yellowstone Ecosystem

Grazing allotments tracked for purposes of grizzly bear conservation include both vacant and active commercial livestock units for sheep, cattle, and/or horses on Federal lands inside the recovery zone. Active allotments are livestock units with active grazing permits. Vacant allotments are those without an active permit, but which may be restocked or grazed periodically by other permittees at the discretion of the land management agency to resolve resource issues or other concerns. Changes in livestock allotments inside the recovery zone that satisfy the allotment standard may occur if the following conditions are met:

- A vacant allotment may be issued a permit resulting in an increase in the number of permitted cattle, but the number and net acreage of active allotments inside the recovery area must not exceed the 1998 baseline. Appropriate analysis by the action agency must be conducted to evaluate impacts on grizzly bears.
- Combining or dividing existing allotments is allowed as long as the net acreage and number of active allotments does not exceed 1998 levels.
- Within capacity, and with the appropriate analysis, increases or reductions in the number of permitted cattle and/or horses can be allowed on active allotments.
- Where chronic grizzly bear conflicts occur on livestock allotments inside the recovery area, and an opportunity exists with a willing permittee, alternatives for resolving conflicts may include authorization of non-use, moving livestock to a vacant allotment where there is less likelihood of conflict, or cattle grazing can be phased out on that allotment.

Conflicts between livestock and grizzly bears have historically led to the relocation or removal of grizzly bears in the Greater Yellowstone Ecosystem. Grizzly bears tend to prey on cattle and sheep regardless of the abundance of natural foods. Most grizzly bear-livestock conflicts tend to occur outside the Recovery Zone since all allotments on National Park lands and many allotments on National Forest lands inside the area have been permanently closed. Consequently, monitoring grizzly bear-livestock conflicts on public lands is not limited to inside the recovery zone, but is conducted annually throughout the entire ecosystem. Currently, approximately 59 percent of the Yellowstone grizzly bear's occupied range falls outside the recovery zone[50]. As permitted livestock grazing persists in areas where grizzly bears live, the number of conflicts will most likely continue to pose a challenge to grizzly bear managers. This is particularly true on sheep allotments. There are no permitted sheep allotments on the Custer Gallatin National Forest.

On federal lands inside the recovery zone, the number and acreage of permitted livestock grazing allotments is monitored and reported annually relative to 1998 levels. Inside and outside the Recovery Zone, grizzly bear conflicts associated with grazing of commercial livestock on federal lands is monitored and reported annually.

Table and Figure D-5. Grizzly bear recovery zone showing current allotment status display details of the allotments that are part of the 1998 baseline and their current status. Sheep allotments on the Custer Gallatin National Forest have been phased out, no new allotments have been established, and several other allotments have been closed. These actions are consistent with current Forest Plan standards and grizzly bear conservation strategy standards for the recovery zone outlined above. Of the 272,767 allotment acres within 1998 recovery zone baseline, 73 percent have been closed, 6 percent are vacant, and 21 percent remain in active allotments.

[50] FINAL DRAFT of the Draft 2016 Conservation Strategy for the Grizzly Bear in the Greater Yellowstone Ecosystem

Table D-3. Allotment status as of 2016 – grizzly bear recovery zone (RZ) 1998 baseline

Allotment	Status in 1998	Current Allotment Status	Allotment Acres in RZ	Allotment Acres out of RZ	Total Allotment Acres	Percent of Allotment Acres in RZ
Green Lake	Active Cattle	Active Cattle	3557	0	3557	100
Horse Creek / Reeder Creek	Active Cattle	Active Cattle	4826	0	4826	100
Sixmile North	Active Cattle	Active Cattle	1840	2288	4128	45
Slip & Slide	Active Cattle	Active Cattle	6794	0	6794	100
South Fork	Active Cattle	Active Cattle	154	0	154	100
Tom Miner / Ramshorn	Active Cattle	Active Cattle	14602	7	14609	100
Watkins Creek	Active Cattle	Active Cattle	3496	0	3496	100
Wigwam	Active Cattle	Active Cattle	2762	0	2762	100
Cinnamon North	Active Horse	Active Horse	1378	0	1378	100
Cinnamon South	Active Horse	Active Horse	2120	0	2120	100
Grayling Creek	Active Horse	Active Horse	115	0	115	100
Moose	Active Horse	Active Horse	18	0	18	100
Sage Creek	Active Horse	Active Horse	14650	0	14650	100
Taylor Fork	Active Horse	Active Horse	932	0	932	100
Current Active Allotment Subtotal			57244	2295	59539	
Percent of Total			21%			
Cottonwood	Vacant Cattle	Vacant Cattle	2199	0	2199	100
Lion Creek	Vacant Cattle	Vacant Cattle	6999	0	6999	100
Mill Creek	Active Cattle	Vacant Cattle	800	0	800	100
Section 22	Active Cattle	Vacant Cattle	586	0	586	100
Sixmile South	Vacant Cattle	Vacant Cattle	6456	0	6456	100
Current Vacant Allotment Subtotal			131528.21	0	17040	
Percent of Total			6%			
Basin	Active Cattle	2015 Closure - Cattle [51]	59	0	59	100
Beaver Creek	Active Cattle	2016 Closure - Cattle	713	6350	7063	10
Cache / Eldridge	Active Cattle	2015 Closure - Cattle	7606	0	7606	100
Canyon	Vacant Cattle	2007Closure - Cattle	4105	365	4470	92
Cedar Creek	Vacant Cattle	2007 Closure - Cattle	8233	0	8233	100
Dry Gulch	Vacant Cattle	2008 Closure - Cattle	1421	0	1421	100
Duck Creek	Vacant Cattle	2008 Closure - Cattle	930	0	930	100

[51] Basin cattle allotment on the Hebgen Lake District consisted of two units, West and East. When the allotment was closed, 34 acres of the West Unit was closed to permitted livestock grazing, and the25 acres of the East Unit was added to the Basin Administrative site to be used as administrative pasture for minor periodic government stock use.

Allotment	Status in 1998	Current Allotment Status	Allotment Acres in RZ	Allotment Acres out of RZ	Total Allotment Acres	Percent of Allotment Acres in RZ
Horse Butte	Active Cattle	2009 Closure - Cattle	2200	0	2200	100
Little Trail Creek	Vacant Cattle	2007Closure - Cattle	2683	0	2683	100
Ousel Falls	Vacant Cattle	2016 Closure - Cattle	8170	11576	19746	41
Park	Active Cattle	2007 Closure - Cattle	14647	0	14647	100
Red Canyon	Vacant Cattle	2015 Closure - Cattle	5227	0	5227	100
Sentinel Butte	Active Cattle	2007Closure - Cattle	570	0	570	100
Sulphur Springs	Active Cattle	2015 Closure - Cattle	257	0	257	100
Wapiti	Active Cattle	2015 Closure - Cattle	7376	0	7376	100
Ash / Iron Mtn	Active Sheep	2006 Closure - Sheep	75002	0	75002	100
Haystack	Active Sheep	2009Closure - Sheep	16568	0	16568	100
Lionhead	Vacant Sheep	2008 Closure - Sheep	5730	0	5730	100
Meatrack / Carbonate	Vacant Sheep	2009 Closure - Sheep	18202	6778	24980	73
Two Top	Vacant Sheep	2008 Closure - Sheep	3710	1004	4713	79
University	Vacant Sheep	2008 Closure - Sheep	15074	0	15074	100
Current Closed Allotment Subtotals			461539.48	26073	224555	
Percent of Total			73%			
Grand Total			272767	28368	301135	

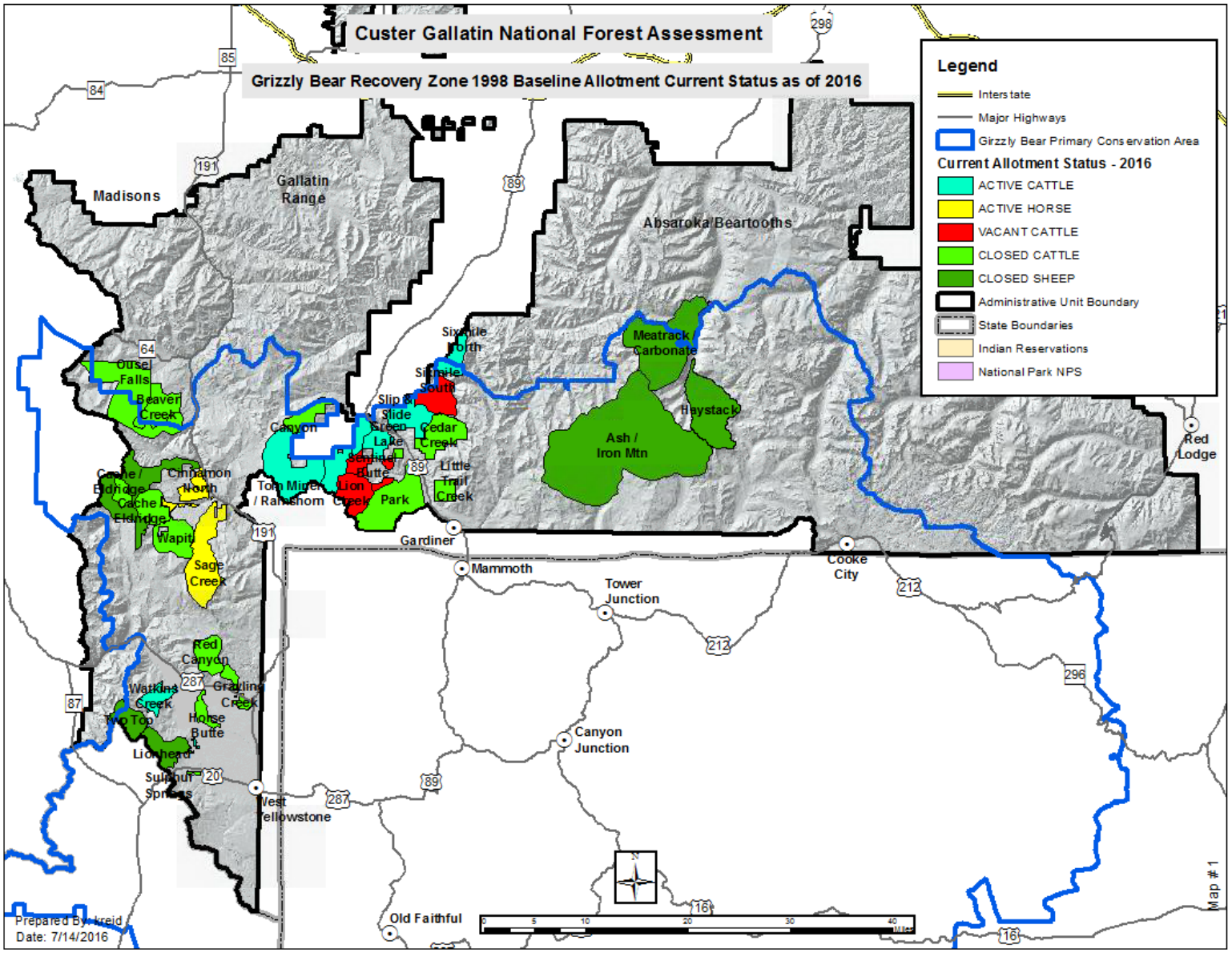

Figure D-5. Grizzly bear recovery zone showing current allotment status

Bison Management Zones

Management of Yellowstone area bison is a controversial issue. Following years of controversy and litigation between State and Federal Agencies, a record of decision for the Interagency Bison Management Plan was signed by the Secretaries of Interior and Agriculture and the Governor of the State of Montana in 2000. Since that decision, bison management within Yellowstone National Park and the State of Montana has been governed by the Interagency Bison Management Plan under its adaptive management framework. Because of new information and changed conditions since the 2000 Interagency Bison Management Plan, the National Park Service and the State of Montana are beginning the process of preparing a new plan and environmental impact statement to manage Yellowstone area bison within the Yellowstone National Park and on adjacent lands in Montana, including portions of the Gardiner and Hebgen Lake Ranger Districts of the Custer Gallatin National Forest. The purpose of the new plan and environmental impact statement is to conserve a wild and migratory population of Yellowstone area bison, while minimizing the risk of brucellosis transmission between bison and livestock to the extent practicable.

Brucellosis has caused devastating losses to ranchers. It has cost the Federal Government, the States, and the livestock industry billions of dollars in direct losses and the cost of efforts to eliminate the disease. Brucellosis causes abortions, infertility, and lowered milk production in cattle and bison and is transmissible to humans as undulant fever. In people, the disease causes severe flu like symptoms that can last for months or years. Equine brucellosis is also caused by *Brucella abortus* and most commonly manifests as fistulous withers in horses, which can be a source of exposure to humans.

The U.S. Department of Agriculture's Animal and Plant Health Inspection Service has been working cooperatively with the livestock industries and State animal health authorities to eradicate brucellosis from the United States. As of March 1, 2002, 48 states have achieved brucellosis-free status with no known infection.

The only known focus of *Brucella abortus* infection left in the nation is in bison and elk in the Greater Yellowstone Area. With respect to this area, the Animal and Plant Health Inspection Service is cooperating with State and Federal agencies to implement a bison management plan, in order to provide for a free ranging bison herd and to prevent exposure of cattle to potentially infected bison. Elk in the Greater Yellowstone Area are currently a self-sustaining brucellosis reservoir and the source of livestock infections. Control measures in bison are unlikely to affect the dynamics of unrelated strains circulating in nearby elk populations (Kamath, et. al., 2016).

During the development of the Interagency Bison Management Plan, the National Forest's interests were principally focused on avoiding co-mingling between bison and cattle on public land allotments, addressing public safety, and mitigating resource impacts from State management action (principally hazing of bison to enforce prescribed tolerance dates and locations).

Yellowstone bison are migratory when conditions in the park are limiting (snowpack). During late winter and spring, bison start migrating toward areas of lower snow pack for easier access to food and to calve. Bison migrations tend to occur northward and westward out of Yellowstone National Park onto lands administered by the Custer Gallatin National Forest, at which point they fall under the jurisdiction of the state of Montana (both the Montana Department of Livestock and Montana Fish Wildlife and Parks).

The timing and extent of bison migration out of the park tend to be density dependent and influenced by snow depth. These annual migrations bring bison into proximity to private ranchlands or public lands where cattle are grazed during some portion of the year. Bison in Yellowstone National Park have

tested 40 to 60 percent positive for brucellosis with 15 to 25 percent actively infected in any given year (YNP DEIS, 2010, p. vi).

The issue of where bison are allowed on lands outside of Yellowstone National Park is a function of the Interagency Bison Management Plan and its adaptive management framework, and is largely driven by concern for the transmission of brucellosis from bison to cattle. An issue exists of whether or not Yellowstone bison are impacted (for example, physical barriers, loss of forage, or displaced by human presence) by permitted grazing.

Some believe that if permitted cows are not in the Hebgen and Gardiner Basins then the Interagency Bison Management Plan would allow for free roaming bison in these areas. The current Interagency Bison Management Plan allows for the plan to be modified based on science and management directions set by Animal Plant Health Inspection Service and by State Department of Livestock. Adaptive management will allow for flexibility in allotment management planning to accommodate changes in bison management.

The Custer Gallatin National Forest can consider various options with grazing permit holders to alleviate potential bison/livestock conflicts. This may include adaptive management National Environmental Policy Act decisions such as authorizing a change in the kind of livestock from cow/calf pairs to horses or steers; or turn cattle out on the allotment later in the season when the transmission of *Brucella abortus* is not likely (for example, after July 15), non-use for resource protection, or other identified opportunities.

On the Hebgen Lake Ranger District, there are two active horse allotments within western bison zone 2, four active horse allotments within the western year-round bison tolerance zone, and two active cow/calf pair allotments and one vacant cow/calf pair allotment outside of but near the western bison management zones to the south and west. On the Gardiner Ranger District, there are two active (6/16 grazing season entry dates) and three vacant cow/calf pair allotments within the northern bison tolerance zone and three active cow/calf pair allotments in Tom Miner Basin outside of but near the northern bison management zones. Forest Service grazing allotments within and near the bison management zones are displayed in Figure , Figure , and Figure .

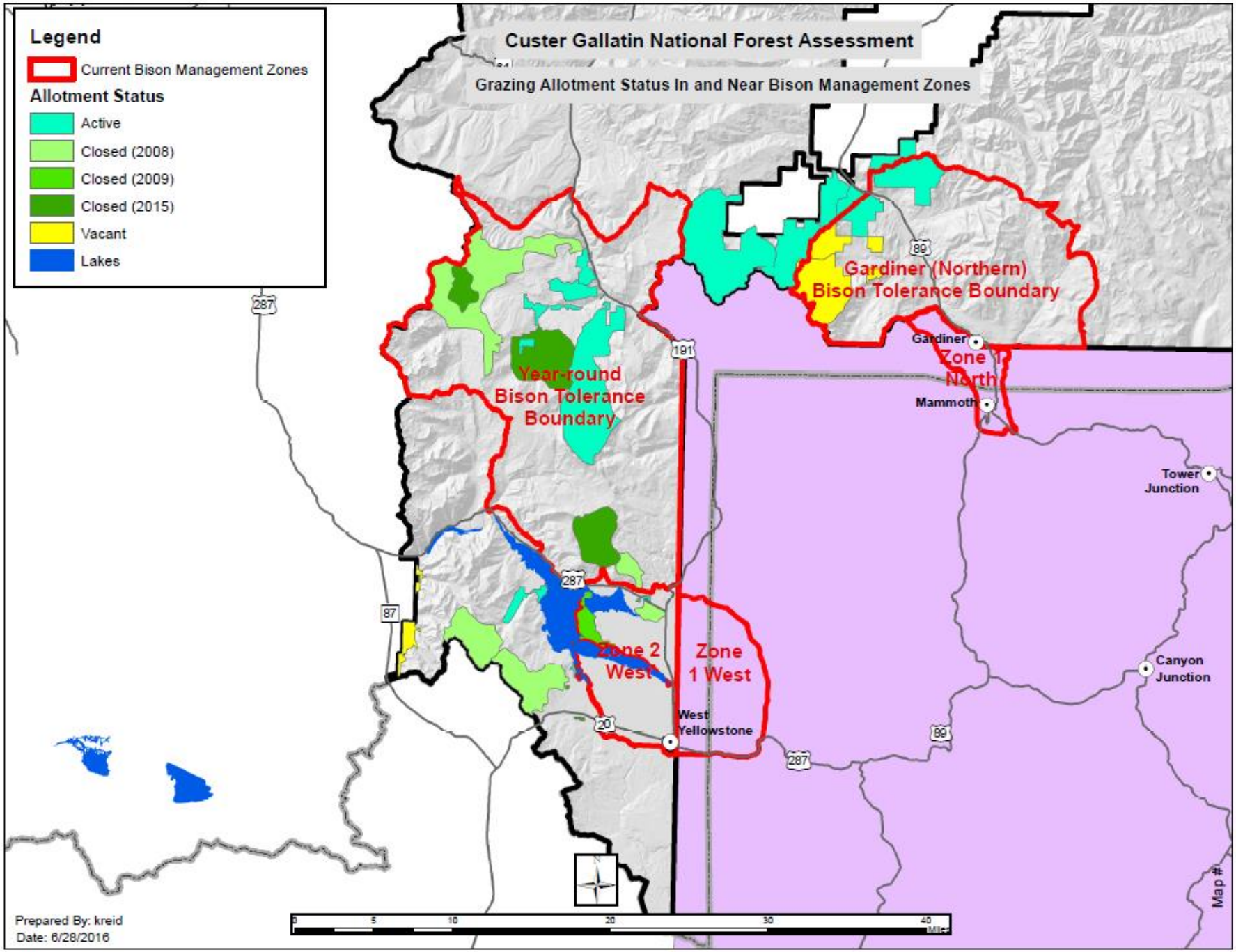

Figure D-6. General location of allotments in or near bison management zones

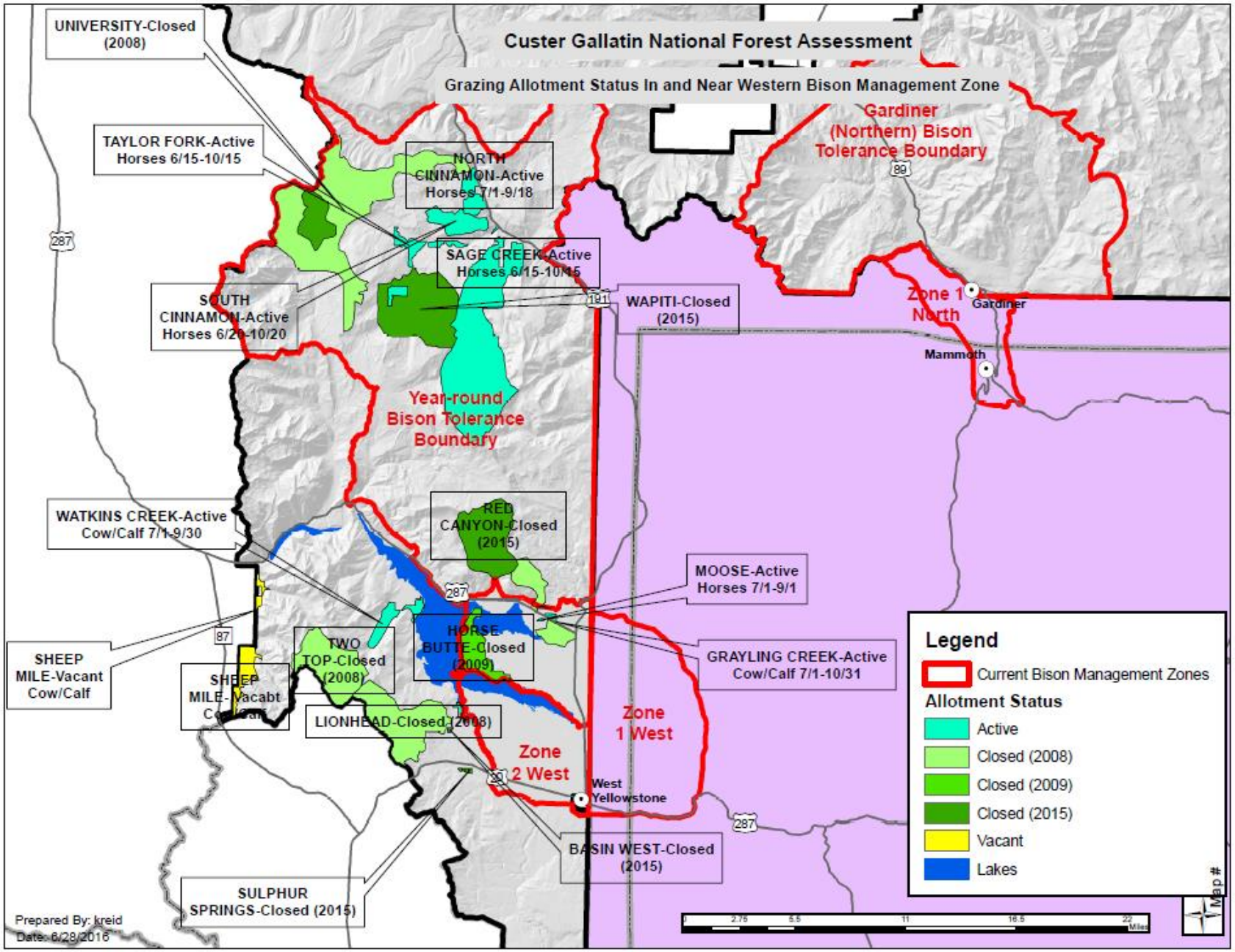

Figure D-7. General location of allotments in or near western bison management zones

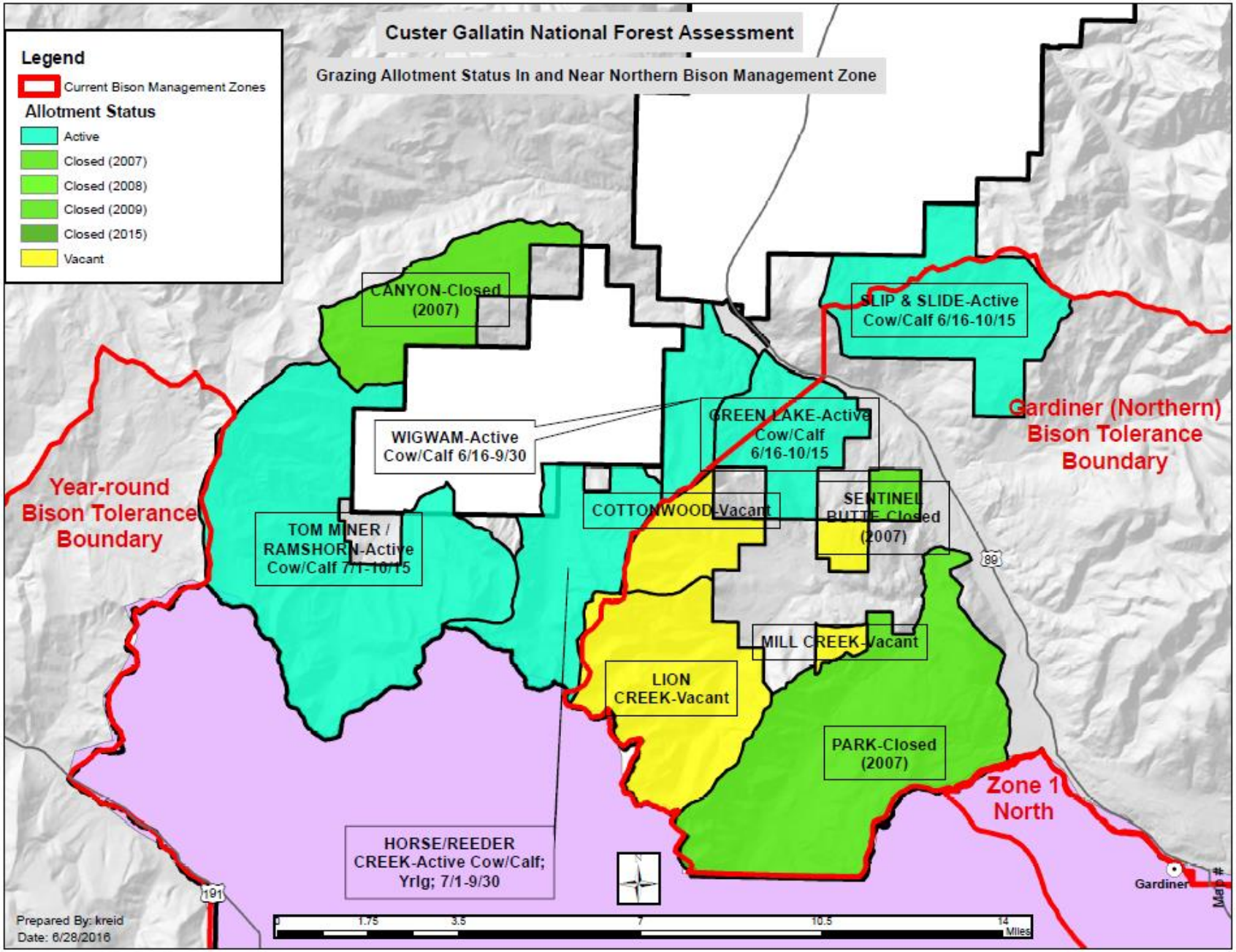

Figure D-8. General location of allotments in or near northern bison management zones

Forest Service grazing allotments within and near the bison management zones are summarized in Table

Table D-4. Allotments within or nearby bison management zones

Allotment Name	Location	Status	Class and Number of Livestock	Permitted Season
Allotments Within Western Bison Zone 2 – Hebgen RD				
Moose	East of Hebgen Lake	Active	4 horses	7/1-9/1
Grayling Creek	East of Hebgen Lake	Active	24 horses	7/1-10/31
Horse Butte	East of Hebgen Lake	Closed (2009)	Previously, cow/calf pairs	
Duck Creek	East of Hebgen Lake	Closed (2008)	Previously, cow/calf pairs	
Dry Gulch	Northeast of Horse Butte, North of Hwy 287	Closed (2008)	Previously, cow/calf pairs	
Allotments Within the Western Bison Yearlong Tolerance Zone – Hebgen RD				
Sage Creek	Taylor Fork Area	Active	129 horses	6/15-10/15
North Cinnamon	Taylor Fork Area	Active	60 horses	7/1-9/18
South Cinnamon	Taylor Fork Area	Active	35 horses	6/20-10/20
Taylor Fork	Taylor Fork Area	Active	90 horses	6/15-10/15
Wapiti	Taylor Fork Area	Closed (2015)	Previously, 160 cow/calf pairs	
Cache-Eldridge	Taylor Fork Area	Closed (2015)	Previously, 154 cow/calf pairs	
University	Taylor Fork Area	Closed (2008)	Previously sheep	
Red Canyon	North of Horse Butte, North of Hwy 287	Closed (2015)	Previously, cow/calf pairs	
Allotments Outside of but Near the Western Bison Management Zones				
Watkins Creek	West of Hebgen Lake	Active	55 cow/calf pairs	7/1-9/30
South Fork	South of Hebgen Lake	Active	15 cow/calf pairs	7/1-9/30
Sheep Mile	South of Quake Lake	Vacant (Forage Reserve Allotment)	Previously, 89 yearlings	Previously, 6/20-10/20
Basin	South of Hebgen Lake	Closed - West Unit (2015)[52];	Previously, 10 cow/calf pairs	
Sulphur Springs	South of Hebgen lake and Hwy 20	Closed (2015)	Previously, 10 horses	
Lionhead	Hebgen Lake Area	Closed (2008)	Previously sheep	
Two Top	Hebgen Lake Area	Closed (2008)	Previously sheep	
Allotments within the Northern Bison Management Zone - Gardiner RD				
Slip and Slide	East of Yellowstone River	Active	110 cow/calf pairs	6/16-10/15

[52] East Unit added to the Basin Adm. Site for periodic government stock use (horse/mule)

Allotment Name	Location	Status	Class and Number of Livestock	Permitted Season
Green Lake	West of Yellowstone River	Active	46 cow/calf pairs	6/16-10/15
Cottonwood	West of Yellowstone River	Vacant	Previously, cow/calf pairs	
Lion Creek	West of Yellowstone River	Vacant	Previously, cow/calf pairs	
Mill Creek & Section 22	Upper Cinnabar and Upper Mulherin	Vacant	Previously, 36 cow/calf pairs	Previously, 6/16-10/15
Park	West of Yellowstone River	Closed (2007)	Previously, cow/calf pairs	
Sentinel Butte	East of Yellowstone River	Closed (2007)	Previously, cow/calf pairs	
Allotments Outside of but Near the Northern Bison Management Zone – Gardiner RD				
Tom Miner and Ramshorn	Tom Miner Basin	Active	126 cow/calf pairs; and Private Land 134 cow/calf pairs	7/1-10/15
Horse Creek / Reeder Creek	Upper Tom Miner	Active	81 cow/calf pairs, 22 yearlings, & 15 horse; and Private Land 15 horses	7/1-9/30
Wigwam	Lower Tom Miner	Active	56 cow/calf pairs; and Private Land 20 cow/calf pairs	6/16-9/30
Canyon	Tom Miner Basin	Closed (2007)	Previously, cow/calf pairs	

Baseline Monitoring

Since bison expansion into tolerance zones can have effects on important rare and diverse resources, riparian areas and streams have preliminarily been identified to establish a baseline for current conditions which will aid in setting desired conditions and site potentials for any future monitoring needs.

Preliminary areas were identified for sampling on the northern zones in Gardiner Basin to assess how riparian sites are currently being used by each of the following management groups.

- Bison and other wildlife grazing. No livestock grazing authorized. Streams identified were Bear and Eagle Creek;
- Livestock and wildlife grazing but no bison. Streams identified were Jim Brown and Slip & Slide Creek;
- Elk and other large herbivores grazing but no bison or livestock grazing permitted. Streams identified were Basset and Little Trail Creek. Initial assessments in 2014 indicated properly functioning conditions for these two areas. In addition, a portion of Cedar Creek also indicated proper functioning condition from the 2014 inventory.

Gardiner Basin provides critical winter range for multiple ungulate species with varying population sizes. They include elk, bighorn sheep, bison, antelope, and mule deer. Preliminary discussions and study designs are being developed to gather baseline data to assess current habitat conditions, how each species utilize the habitat, and forage preferences and utilization of forage by each ungulate species. Once these questions are determined additional study designs would likely include determination if there is sufficient habitat and forage for the current populations of each wintering species; how

increases or decreases in one ungulate species might impact other ungulate species; the degree of competition among species; and identification of habitat manipulation projects (burning, cutting, other) to address limiting factors for the various species.

Greater Sage-Grouse Habitat

Sagebrush steppe vegetation on the Custer Gallatin National Forest has high levels of native plant species diversity and provides essential habitat requirements for many wildlife species. Montana, North and South Dakotas, Wyoming, Oregon, Nevada, and Idaho, are the strongholds for sage-grouse across their range and have been the focus of recent petitions to list the species under the federal Endangered Species Act. The primary concerns for sage-grouse are loss and fragmentation of their habitat. The species' sagebrush habitat components are important for this species persistence. Because of this habitat concern, core areas that are priorities for habitat protection and/or improvement. Figure and Figure display general and core habitat within the assessment area by montane and pine savanna ecosystems.

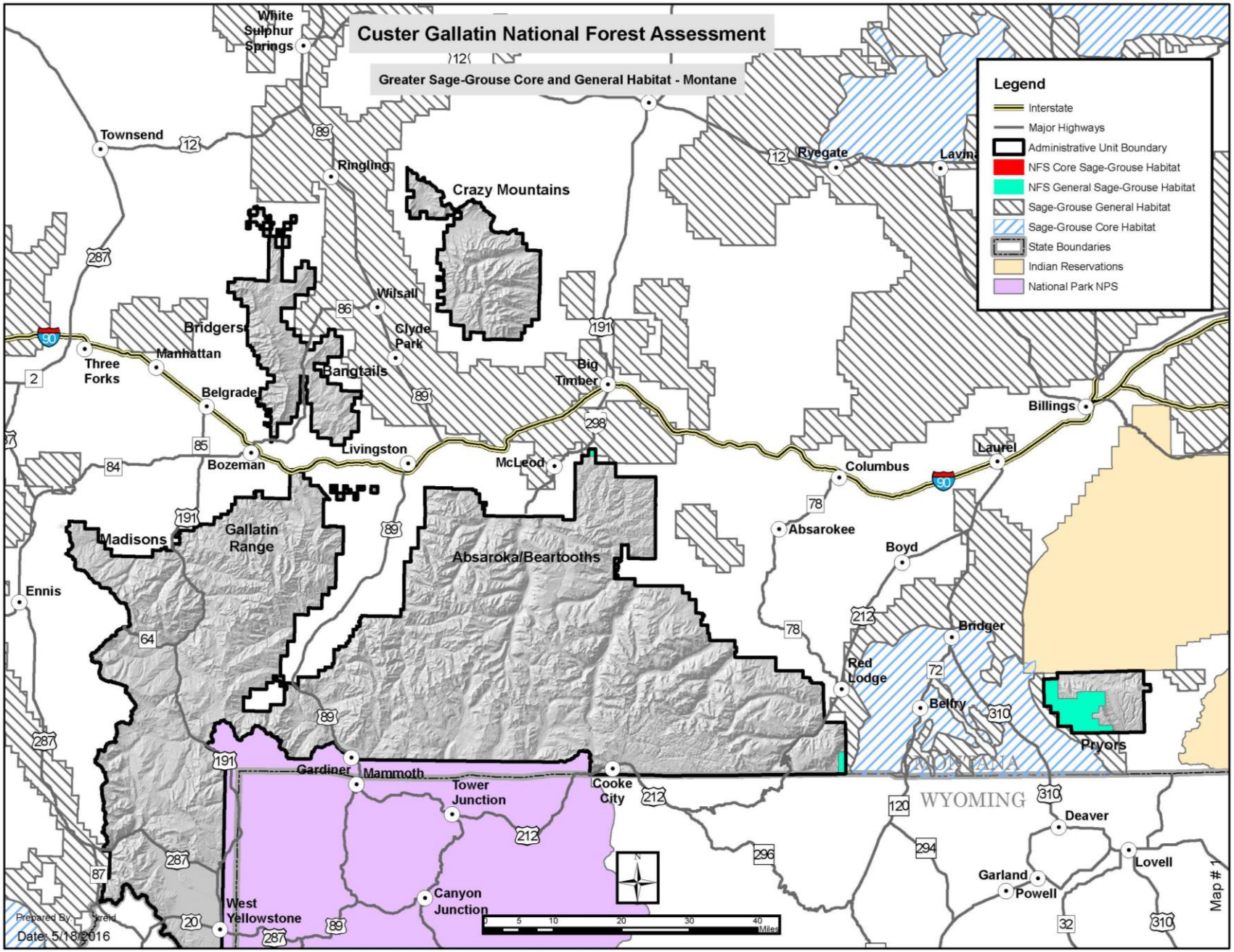

Figure D-9. General and core habitat within the montane units

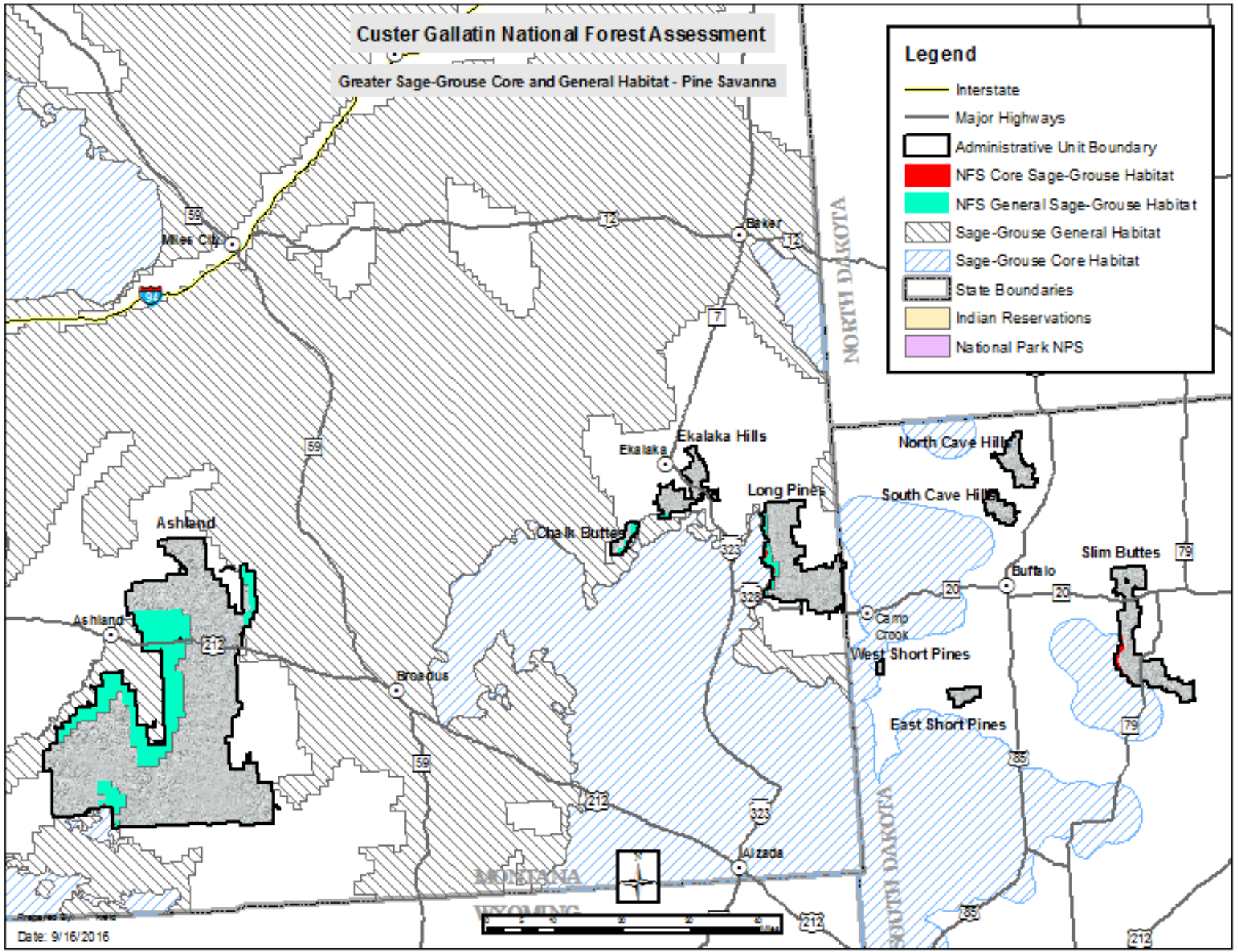

Figure D-10. General and core habitat within the pine savanna units

Table outlines the amount of greater sage-grouse core and general habitat by landscape area.

Table D-5. Acreage of greater sage-grouse habitat by landscape area

Landscape Area	Core Habitat[53]	General Habitat	Grand Total
Montane Units			
Madison, Henry's, Gallatin, Absaroka and Beartooth Mtns.		2776	2776
Bridger, Bangtail, Crazy Mtns		4	4
Pryor Mtns		27392	27392
Montane Subtotal	0	30172	30172
Pine Savanna Units			
Ashland	336	101290	101626
Sioux	1868	8424	10292
Pine Savanna Subtotal	2204	109714	111918
Grand Total	2204	139886	142090

About 100 percent of core and about 88 percent of general greater sage-grouse habitat found in the assessment area are within grazing allotments. Within allotments, approximately 2200 acres are core while about 123,400 acres are considered general habitat. Table summarizes the amount of greater sage-grouse habitat found within grazing allotments by landscape area.

Table D-6. Acreage of greater sage-grouse habitat within permitted grazing allotments

Allotment #	Core Habitat	General Habitat	Grand Total
Montane Units			
Madison, Henry's, Gallatin, Absaroka and Beartooth Mtns		520	520
Bridger, Bangtail, Crazy Mtns		520	520
Pryor Mtns		1040	1040
Montane Subtotal	0	22674	22674
Pine Savanna Units			
Ashland	336	24754	24754
Sioux	1868	8214	10082
Pine Savanna Subtotal	2204	100693	34836
Grand Total	2204	123367	125571

Table outlines the amount of greater sage-grouse habitat found within specific grazing allotments by landscape area.

[53] Per MT Fish, Wildlife, and Parks GIS metadata, Sage-grouse core areas are habitats associated with 1) highest densities of sage-grouse, based on male counts and/or 2) sage-grouse lek complexes and associated habitat important to sage-grouse distribution.

Table D-7. Acreage of greater sage-grouse habitat by specific grazing allotment

Allotment #	Allotment Name	Core Habitat	General Habitat	Grand Total
Montane Units				
Madison, Henry's, Gallatin, Absaroka and Beartooth Mtns				
00135	WEST FORK DEER CREEK		520	520
Bridger, Bangtail, Crazy Mtns				
00604	BATTLERIDGE		2	2
Pryor Mtns			2	2
20833	BIG PRYOR		5355	5355
20835	BEAR CANYON		14378	14378
20839	CROOKED CREEK		619	619
20874	SAGE CREEK		1800	1800
Montane Subtotal		0	22674	22674
Pine Savanna Units				
Ashland				
40678	3 X BAR	305	1779	2084
40680	WEST TOOLEY	31	2481	2512
40683	COW CREEK		553	553
40685	TIMBER CREEK		84	84
40686	WEST O'DELL		7144	7144
40687	CUB CREEK - A+E		3952	3952
40690	STAG ROCK		3483	3483
40692	RED BULL		858	858
40711	SOUTH LYON		1017	1017
40712	NORTH LYON		1680	1680
40714	ELK CREEK		341	341
40716	ASH CREEK		246	246
40718	BRIAN-GOOSEBERRY		1150	1150
40720	COAL CREEK		1981	1981
40721	COLEMAN DRAW		4155	4155
40722	EAST FORK		6430	6430
40724	EAST O'DELL		8202	8202
40725	ELK RIDGE		3113	3113
40726	FIFTEEN MILE		4771	4771
40727	GOLD		4232	4232
40729	KING CREEK		6215	6215
40730	LOWER HOME		1466	1466
40732	PADGET CREEK		3427	3427
40733	SHORTY CREEK		4603	4603
40736	TEN MILE		6515	6515

Allotment #	Allotment Name	Core Habitat	General Habitat	Grand Total
40739	WEST HOME		8610	8610
40742	TEN MILE - THREE MILE		505	505
40744	DEER CREEK		3486	3486
Sioux				
30758	BELLTOWER		949	949
30761	BURDITT	110	1576	1686
30762	BYE-MRIZEK	1		1
30767	CEDAR CANYON	1019		1019
30774	DEVILS CREEK-NEECE	9	688	697
30776	EAST TRENK		561	561
30780	GROSS	222	1003	1225
30783	HARKINS		768	768
30791	KORTUM		295	295
30792	LAMPKIN GULCH	18	974	992
30800	NORTH ASHCROFT	2		2
30803	NORTH TRENK		385	385
30806	PARK		27	27
30807	PEABODY		549	549
30814	SOUTH ASHCROFT	484		484
30819	SUMMERS	2	259	261
30824	WEST TRENK		181	181
Pine Savanna Subtotal		2204	100693	102897
Grand Total		2204	123367	125571

Appendix E – Allotments Closed Since 1986 Forest Plans

Historically, many sheep allotments on the montane units were closed generally due to resource considerations and market conditions. For a variety of reasons, 59 allotments (primarily cattle) have been formally closed on the Gallatin portion of the Custer Gallatin National Forest since the 1986 Forest Plans[54]. Nine[55] of the 59 closures were done through decisions made in the 1986 Forest Plan while the remaining 50 have been closed since then. The 50 closed allotments consisted of approximately 352,500 acres[56]. Available data for 20 of the closed allotments indicate that at least 6000 animal unit months were removed from the suitable primary National Forest System rangelands. Closures were typically done after years of allotments being vacant and were based on allotment viability, logistics and economics of operations, limited access, ownership changes from land exchanges, failing infrastructure, grizzly bear conservation, and other wildlife considerations. See Figure and Table for details.

[54] A few pastures of an allotment on the Beartooth District of the former Custer NF have been closed for resource and management considerations since the 1986 Forest Plan.

[55] 1986 GNF FP p. II-20 states that the following vacant allotments will be closed: Rainbow (Big Timber); Horseshoe, Wounded Man, Little Trail Cr. (Gardiner); Eaglehead (Bozeman); and Cabin Creek, Cub Cr, Steamboat, Kirkwood (Hebgen Lake). This was based on absence of suitable range, changes in livestock kind, and resource conflicts. Those portions that were suitable were to be incorporated into adjoining allotments when compatible with other resource values.

[56] ~1400 acres on the Sage Creek Allotment on the Beartooth District were formerly closed per NEPA decisions to address logistical and resource considerations.

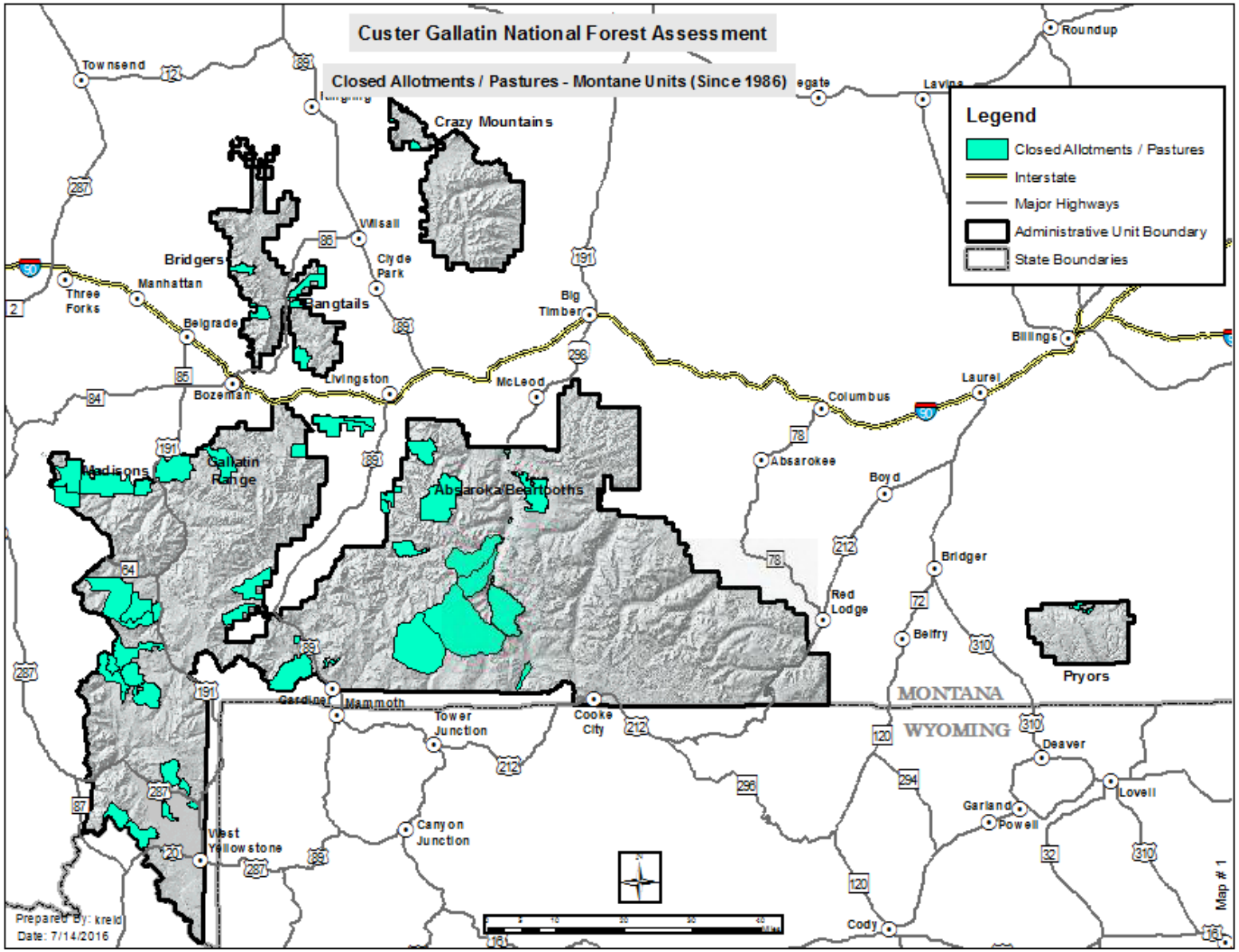

Figure E-1. Closed allotments/pastures since 1986

Table E-1. Closed allotments since the 1986 Forest Plan – montane units

Admin. District	Allotment	Allotment #	Adm. Closure Date	Reason for Closure
Big Timber	Rainbow		1986	Closed per 1986 Forest Plan decision; absence of suitable range, changes in livestock kind, and resource conflicts.
Big Timber	Haystack	00114	2009	Grizzly Bear Habitat Conservation
Big Timber	Meatrack / Carbonate	00121	2009	Long-term vacancy; limited amount of livestock forage, no longer provides for a viable allotment; high wildlife and fish values
Big Timber	West Boulder	00130	2009	Long term vacancy; limited access; high wildlife values
Big Timber	East Boulder Plateau	00109	2009	Long term vacancy; limited access; high wildlife values
Big Timber	Miller Creek	00122	2009	Limited forage; high wildlife values
Big Timber	Natural Bridge	00123	2009	Limited forage; high wildlife values; high recreational use
Livingston	Honey Run	00212	1992	Limited viability; based on sale of "off" land and waiver
Livingston	Wineglass	00235	1999	Not viable; Lease Cancelled by Owner of Private portion 12/31/1998
Livingston	Coke	00204	1999	Not viable; Lease Cancelled by Owner of Private portion 12/31/1998
Livingston	Deep Creek North	00205	2009	Not viable; limited forage; below lower limits; limited access
Livingston	Bald Knob	00240	2012	Unknown
Livingston	Cascade	00223	2009	Not viable; limited forage; below lower limits; limited access
Livingston	North McDonald	00216	2009	Not viable; limited forage; below lower limits; limited access
Livingston	Meadow Creek On/Off	00217	2009	Not viable; limited forage; below lower limits; limited access
Livingston	Rock Creek	00224	2009	Not viable; limited forage; below lower limits; limited access
Livingston	Sage	00225	2009	Not viable; limited forage; below lower limits; limited access
Livingston	Strawberry	00231	2009	Not viable; limited forage; below lower limits; limited access
Gardiner	Little Trail Creek		1986	Closed per 1986 Forest Plan decision; absence of suitable range, changes in livestock kind, and resource conflicts.
Gardiner	Horseshoe		1986	Closed per 1986 Forest Plan decision; absence of suitable range, changes in livestock kind, and resource conflicts.
Gardiner	Wounded Man		1986	Closed per 1986 Forest Plan decision; absence of suitable range, changes in livestock kind, and resource conflicts.
Gardiner	Ash Creek	00301	2006	Grizzly Bear Recovery
Gardiner	Iron Mountain	00308	2006	Grizzly Bear Recovery

Admin. District	Allotment	Allotment #	Adm. Closure Date	Reason for Closure
Gardiner	Cedar Creek	00303	2007	Elk winter range, calving grounds, and migration area. Vacant since 1984.
Gardiner	Sentinel	00316	2007	Viability removed as a result of land consolidation; High elk and bison habitat & migration value. Vacant since 2001.
Gardiner	Park	00312	2007	Viability removed as a result of land consolidation; High elk and bison habitat & migration value. Vacant since 2002.
Gardiner	Little Trail Creek	00307	2007	Elk winter range, calving grounds, and migration area. Vacant since 1981.
Gardiner	Canyon	00302	2007	Transitory Range exhausted; limited viability. Vacant since 1995.
Bozeman	Eaglehead		1986	Closed per 1986 Forest Plan decision; absence of suitable range, changes in livestock kind, and resource conflicts.
Bozeman	Antelope	00602	2009	Not Viable - NFS lands removed due to land exchange
Bozeman	Nixon	00639	2009	Not Viable - NFS lands removed due to land exchange
Bozeman	Spring Creek	00653	2009	Not Viable - NFS lands removed due to land exchange
Bozeman	Skunk Creek	00651	2009	Not Viable - NFS lands removed due to land exchange
Bozeman	Red Knob South	00648	2009	Vacant; High Wildlife Values
Bozeman	Spanish Creek	00652	2009	Vacant; Not Viable Due to Limited Access; High Wildlife Values
Bozeman	Twin Creek	00661	2009	Vacant; High Wildlife Values
Bozeman	Cherry Creek	00618	2009	Vacant; Viability Due to Limited Access; High Wildlife Values
Bozeman	North Cottonwood	00640	2009	Access; Unsuitable range in High Elevation
Bozeman	South Cottonwood	00654	2009	Vacant; Steep; limited forage; potential for conflict with recreationists
Bozeman	Potter Jones	00645	2009	Vacant; Steep; limited forage; no legal access
Bozeman	Yankee	00667	2009	Vacant; no legal access
Bozeman	Buck Creek	00613	2016	Vacant; After land exchange, economics of trucking livestock for limited capacity not worthwhile; large investments into infrastructure would be necessary.
Bozeman	Ousel Falls	00642	2016	Vacant; Land exchange placed the majority into private ownership. Limited access.
Bozeman	Beaver Creek	00607	2016	Vacant; Access limited and difficult
Hebgen	Cabin Creek		1986	Closed per 1986 Forest Plan; absence of suitable range, changes in livestock kind, and resource conflicts.
Hebgen	Cub Creek		1986	Closed per 1986 Forest Plan; absence of suitable range, changes in livestock kind, and resource conflicts.

Admin. District	Allotment	Allotment #	Adm. Closure Date	Reason for Closure
Hebgen	Steamboat		1986	Closed per 1986 Forest Plan; absence of suitable range, changes in livestock kind, and resource conflicts.
Hebgen	Kirkwood		1986	Closed per 1986 Forest Plan; absence of suitable range, changes in livestock kind, and resource conflicts.
Hebgen	Lionhead	00710	2008	To comply with Forest Plan direction related to grizzly bear habitat management. Vacant since the late 1980s.
Hebgen	Two Top	00727	2008	To comply with Forest Plan direction related to grizzly bear habitat management. Vacant since the late 1980s.
Hebgen	University	00723	2008	To comply with Forest Plan direction related to grizzly bear habitat management. Vacant since the early 1990s.
Hebgen	Dry Gulch	00706	2008	Limited forage. Vacant since the late 1980s
Hebgen	Duck Creek	00707	2008	Limited forage. Vacant for many years.
Hebgen	Horse Butte	00708	2009	Bison Conflicts
Hebgen	Basin - West Pasture Only	00702	2015	Limited Capacity. Under Lower Limit
Hebgen	Sulphur Springs	00715	2015	Limited Capacity. Under Lower Limit
Hebgen	Red Canyon	00712	2015	Limited capacity due to steep heavily forested area.
Hebgen	Wapati	00724	2015	Limited capacity due to limited water
Hebgen	Cache - Eldridge	00726	2015	Limited capacity and wildlife values